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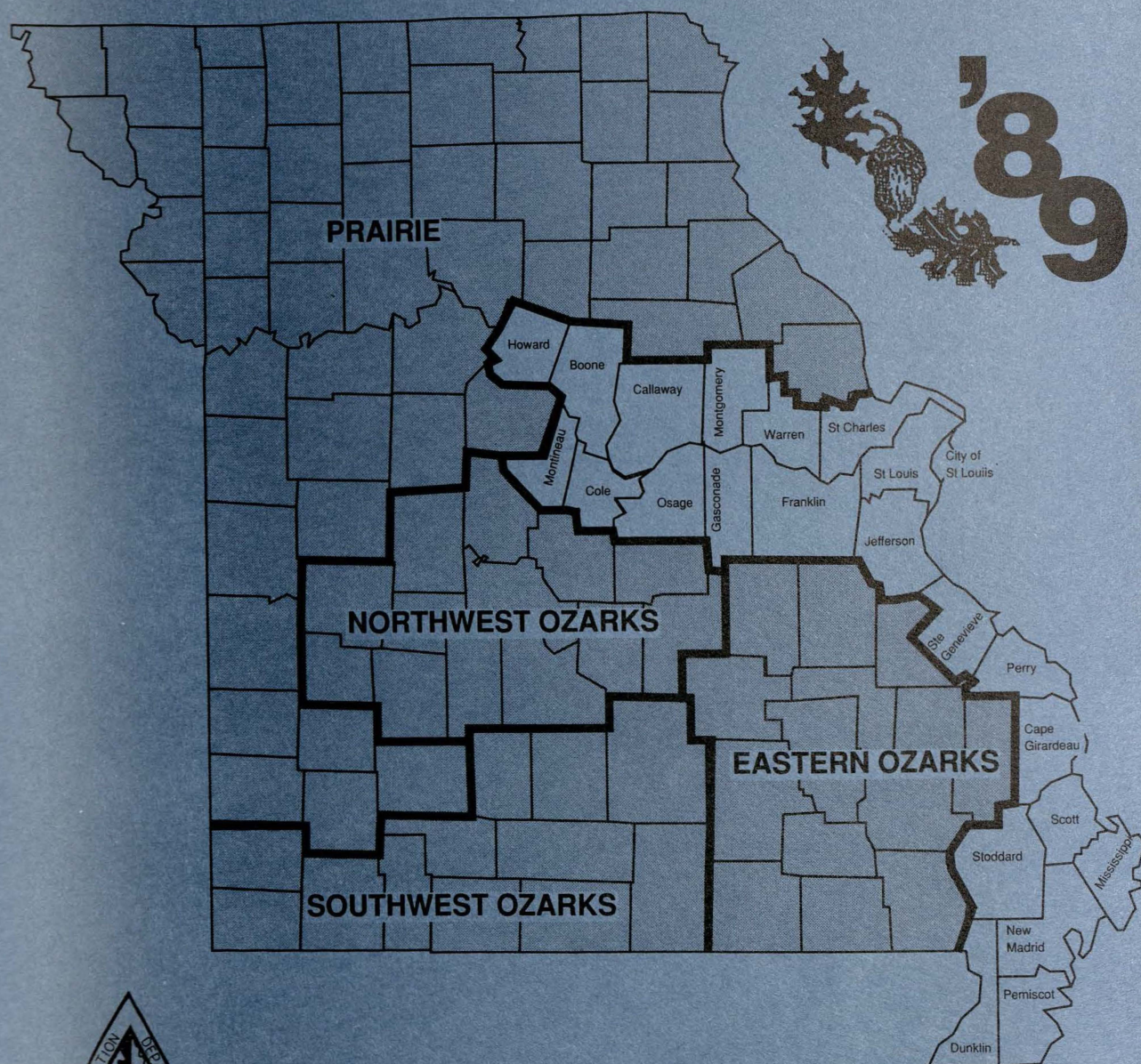
North Central
Forest Experiment
Station

Resource
Bulletin NC-118



Timber Resource of Missouri's **Riverborder**

Mark H. Hansen



This report includes the most commonly used Forest Inventory and Analysis statistics. However, additional forest resource data can be provided to interested users. Persons requesting additional information that can be provided from the raw inventory data are expected to pay the retrieval costs. These costs range from less than \$100 for a relatively simple request to \$2,000 for a complex retrieval involving the services of a Forest Inventory and Analysis computer programmer. Requests will be filled so as to minimize the impact on the Forest Inventory and Analysis Work Unit.

Requests for unpublished information may be directed to:

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Area served: Illinois, Indiana, Iowa, Kansas, Michigan,
Minnesota, Missouri, Nebraska, North Dakota,
South Dakota, Wisconsin

Requests for unpublished information from the Missouri
inventory may also be directed to:

State Forester
Missouri Department of Conservation
Forestry Division
P.O. Box 180
Jefferson City, Missouri 65102
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**Manuscript approved for publication January 24, 1991
1991**

FOREWORD

Forest Inventory and Analysis (FIA) is a continuing endeavor as mandated by the Renewable Forest and Rangeland Resources Planning Act of 1974. Prior inventories were mandated by the McSweeney-McNary Forest Research Act of 1928. The objective of FIA is to periodically inventory the Nation's forest land to determine its extent, condition, and volume of timber, growth, and depletions. Up-to-date resource information is essential to frame intelligent forest policies and programs. USDA Forest Service regional experiment stations are responsible for conducting these inventories and publishing summary reports for individual States. The North Central Forest Experiment Station is responsible for forest resource evaluation in Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, South Dakota, and Wisconsin.

Fieldwork for the Missouri statewide forest inventory was begun in January 1987 and completed in June 1989. Reports on the three previous inventories of Missouri's timber resource are dated 1947, 1959, and 1972.

More accurate survey information was obtained during the 1989 survey than otherwise would have been feasible because of intensified field sampling. Such sampling was made possible by additional funding provided by the Missouri Department of Conservation. The Department also surveyed primary wood-using plants in the State. Data from this survey were used to help estimate the quantity of timber products harvested in the State. Missouri Department of Conservation personnel have also assisted in training field personnel, analyzing information obtained from the survey, and preparing this report.

Aerial photos used in the Missouri Forest Inventory were furnished by the USDA Agricultural Stabilization and Conservation Service and the Missouri Department of Natural Resources Geology and Land Survey.

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HIGHLIGHTS

NOTE: *Data from new forest inventories are often compared with data from earlier inventories to determine trends in forest resources. However, for the comparisons to be valid, the procedures used in the two inventories must be similar. As a result of our ongoing efforts to improve the efficiency and reliability of the inventory, several changes in procedures and definitions have occurred since 1972. Because some of these changes will make it inappropriate to directly compare the 1989 data with those published for 1972, data from the 1972 inventory will be reprocessed using the 1989 procedures and will be published in part in the State statistical report. Please refer to the Appendix section labeled "Comparing Riverborder Fourth Inventory with the Third Inventory" for more details.*

General

The Riverborder Survey Unit is a strip of 22 counties adjacent to the Missouri and Mississippi Rivers (see cover). It contains 8 million acres or 18 percent of Missouri's land area.

Because proximity to the two major rivers encouraged early settlement and rapid development, it is not surprising that half of the State's population resides here. However, most of the people are concentrated in the highly industrialized area around St. Louis. Outside the St. Louis metropolitan area, the region is predominantly rural.

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The Riverborder can be divided into two distinct subregions. North of Scott County lies a network of rolling river hills and bluffs dissected by numerous tributary streams and drainages. This is the beginning of the Ozark hills to the south and west. In counties along the Missouri River, the transition from level prairie on the north to the Ozarks on the south can be seen. From Scott County southward, the topography is quite different. This area, known as the Bootheel, is the northern extremity of the Mississippi Alluvial Plain that extends south through Arkansas and Louisiana to the Gulf of Mexico. Except for Crowley's Ridge and Commerce Hills, the remnants of an old upland, the region is broad and flat, sloping very gently to the south.

Forest Area

The counties in the north-central portion of the Riverborder Unit (Osage, Gasconade, Warren, Franklin, Jefferson, and Ste. Genevieve) remain the most heavily forested (fig. 1). Even though these counties comprise only 29 percent of the Unit's total area, they contain 51 percent of the forest cover.

The 2.1 million acres of timberland reported in 1989 are essentially equal to the area reported in 1972. Ste. Genevieve was the only county to gain more than 20 thousand acres of timberland, having an increase of more than 15 percent in timberland area between inventories. St. Louis and Osage were the only counties to lose more than 20 thousand acres. Osage County lost about 15 percent of its timberland and St. Louis County lost about half of its.

Reserved forest land increased more than 45 thousand acres between surveys. The reason for this increase was the addition of lands to Missouri Department of Conservation State parks

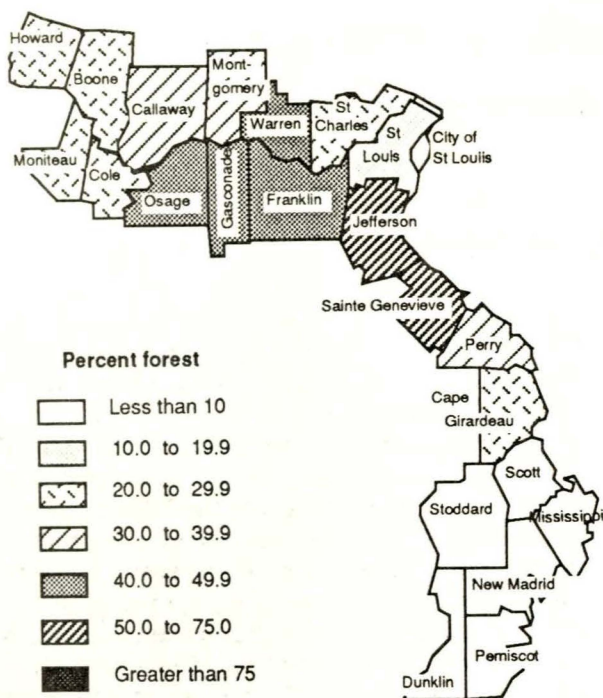


Figure 1.—Percent forest land by county, Riverborder.

and natural areas, various county and municipal parks and recreation areas, and U.S. Army Corps of Engineers recreation areas. Much of the 37 thousand acres of timberland lost in St. Louis County went into county parks. The 1972 inventory showed less than 3 thousand acres of reserved land in St. Louis County; in 1989 more than 25 thousand acres were found. Some of these areas, mainly smaller county parks and natural areas outside of state parks, may have existed in 1972 but were included in timberland in the 1972 report. In the 1989 inventory every effort was made to account for all areas of reserved forest land. All forested areas designated as public use recreation areas where tree removals are only for recreational facility improvement or safety were classified as reserved forest land. This classification is not imposed by the Corp of Engineers, which rarely precludes commercial timber management from any forested area. All designated recreation areas have been classified as reserved to maintain

consistency with other public recreation areas such as State, county, and municipal parks where commercial timber harvesting is restricted.

Eighty-five percent of the timberland area is held by non-industrial private owners (fig. 2). These are private owners who do not operate wood processing plants. Public agencies own only 6 percent of the timberland; the Missouri Department of Conservation is the largest public owner.

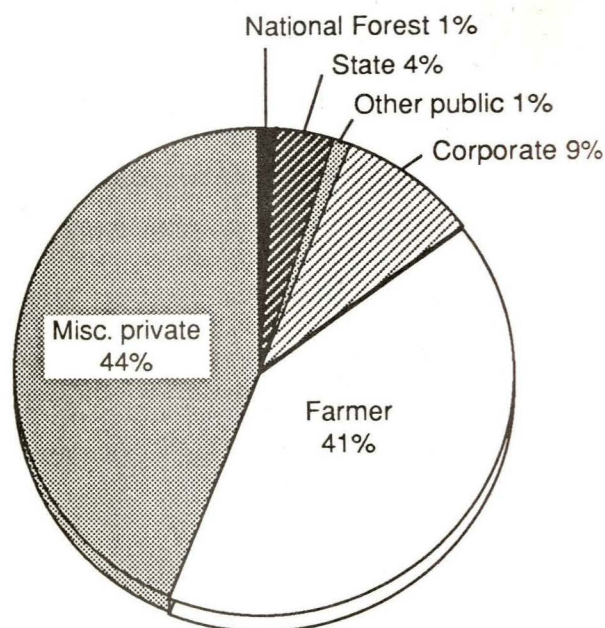


Figure 2.—Area of timberland by owner class, 1989.

The white oak forest type (650 thousand acres) and the black-scarlet oak type (519 thousand acres) still dominate the Unit's timberland base. A gain in the area of sawtimber size stands (currently 1.3 million acres) indicates the continuing net growth of the forests.

Volume

Volume of growing stock totaled 1.7 billion cubic feet in 1989 or 833 cubic feet per acre.

Oak species account for 60 percent (1.05 billion cubic feet) of the growing-stock volume in the Unit (fig. 3).

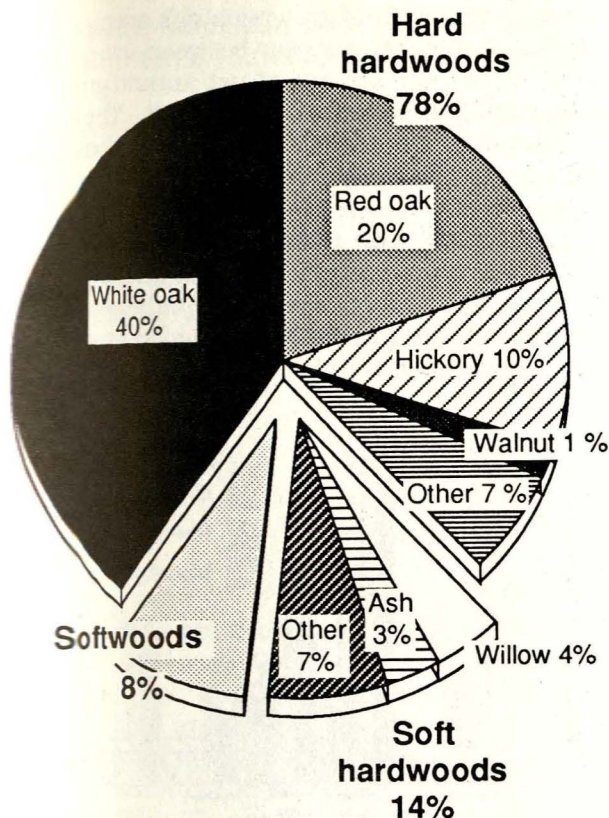


Figure 3.—Volume of growing stock by major species group.

Many trees in Missouri have short boles and poor form because they developed in the open conditions following the early clearing of the forest and use of the land for farming. This history has resulted in forests with low volumes per acre and poor form. One third of the total net volume of live hardwood trees is in cull trees (fig. 4). If the usable volume of all short-log and rough trees were included, volume per acre in the Riverborder would jump from 833 cubic feet per acre for growing stock to 1,172 cubic feet per acre.

Sawtimber volume (the volume of large, growing-stock trees) totaled 5.61 billion board feet in 1989 or 2,682 board feet per acre.

Forty-eight percent (2.5 billion board feet) of hardwood sawtimber volume is in trees 11 to 15 inches d.b.h., 39 percent (2.1 billion board feet) is in trees 15 to 21 inches d.b.h., and 13 percent (0.7 billion board feet) is in trees more than 21 inches d.b.h. (fig. 5).

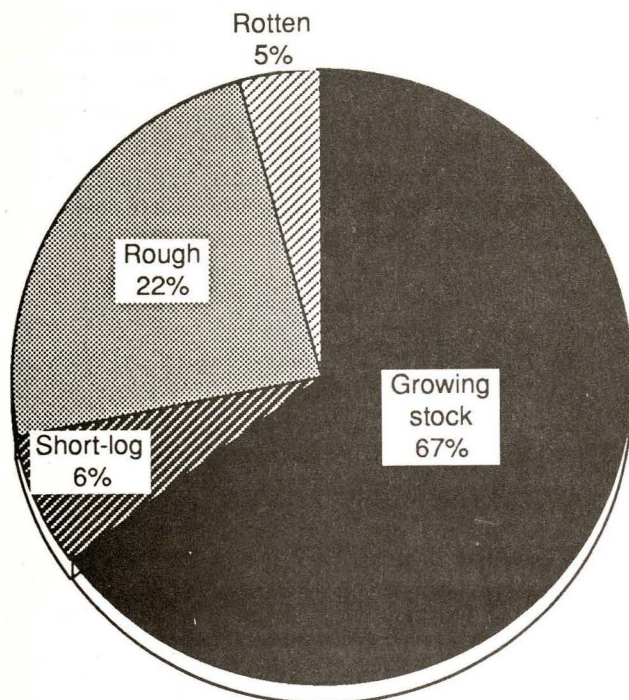


Figure 4.—Distribution of all live volume of hardwood species by tree class.

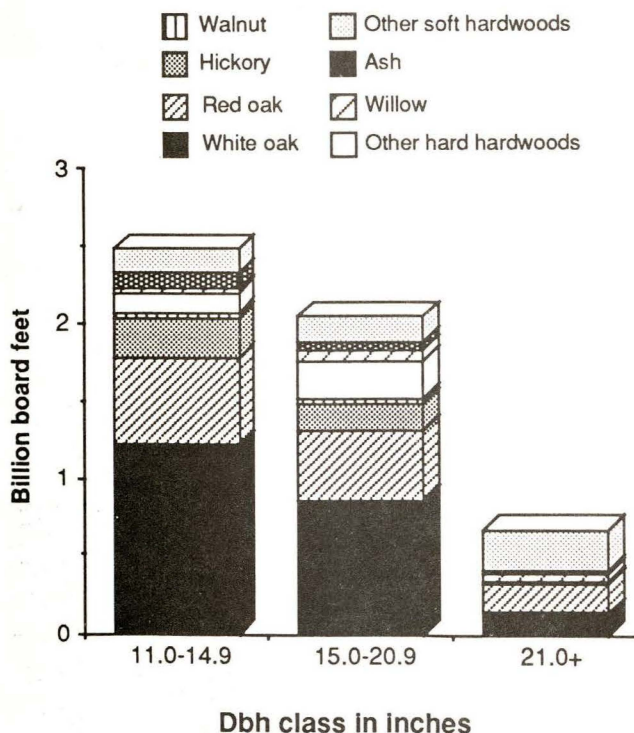


Figure 5.—Hardwood sawtimber volume by species group and diameter class.

Species of white oaks contain the most sawtimber with just over 2.2 billion board feet; red oak species are second with 1.2 billion board feet. One third of the softwood sawtimber is eastern redcedar. Eastern redcedar trees less than 13 inches d.b.h. account for about half (204 million board feet) of the total softwood sawtimber in the Riverborder.

Stand Conditions and Timber Use

More than half of the timberland in the Unit is capable of growing 50 cubic feet or more of wood per acre per year, but actual growth is well below this capability. Net growth of growing stock totaled 44.3 million cubic feet in 1988 or 21.2 cubic feet per acre per year. Sawtimber growth totaled 196 million board feet in 1988. Under proper management and protection, growth on these lands can be increased.

Growing-stock mortality averaged 16.1 million cubic feet per year between surveys or 0.9 percent of inventory. Of the species groups having more than 10 million cubic feet of growing stock, willow and elm were the only two in which mortality exceeded 2.0 percent of inventory. Very little cutting of any willows (leaving them to die of natural causes) and Dutch elm disease are the most likely reasons for the high mortality rates in these two species.

Annual removals of growing stock averaged 21.2 million cubic feet per year between inventories, only 48 percent of current net annual growth (44.3 million cubic feet) in the Unit. The low removals and mortality rates of softwoods (fig. 6) relative to growth are an indication of the young vigorous stands not yet being harvested. Only 49 percent of the area in softwood forest types (shortleaf pine, eastern redcedar and eastern redcedar-hardwood) are of sawtimber size; 64 percent of the area in the hardwood forest types is in sawtimber stands.

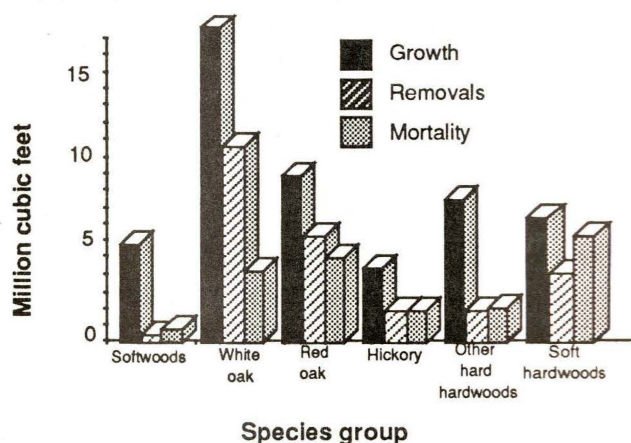


Figure 6.—Annual growth, removals, and mortality of growing stock on timberland by major species group.

APPENDIX

ACCURACY OF SURVEY

Forest Inventory and Analysis information is based on a sampling procedure designed to provide reliable statistics at the State and Survey Unit levels. Consequently, the reported figures are estimates only. A measure of reliability of these figures is given by sampling errors. These sampling errors mean that the chances are two out of three that if a 100-percent inventory had been taken, using the same methods, the results would have been within the limits indicated.

For example, the estimated growing-stock volume in the Unit in 1989, 1,742.7 million cubic feet, has a sampling error of ± 2.7 percent (± 47.1 million cubic feet). The growing-stock volume from a 100-percent inventory would be expected to fall between 1,789.8 and 1,695.6 million cubic feet ($1,742.7 \pm 47.1$), there being a one in three chance that this is not the case.

The following tabulation shows the sampling errors for the 1989 Riverborder Forest Inventory:

Item	Unit totals	Sampling error
Growing stock	(Million cubic feet)	(Percent)
Volume (1989)	1,742.7	2.7
Growth (1988)	44.3	5.2
Average annual removals (1972-1988)	21.2	23.5
Sawtimber	(Million board feet)	
Volume (1989)	5,199.6	3.6
Growth (1988)	195.9	4.8
Average annual removals (1972-1988)	79.0	29.1
Timberland	(Thousand acres)	
Area (1989)	2,092.7	1.5

As survey data are broken down into sections smaller than Survey Unit totals, the sampling error increases. For example, the sampling error for timberland area in a particular county is higher than that for total timberland area in the Unit. This tabulation shows the sampling errors for Unit totals. To use this information for data smaller than Unit totals, use the following formula to compute error estimates:

$$E = \frac{(SE) \sqrt{(\text{Unit total area or volume})}}{\sqrt{(\text{Volume or area smaller than Unit total})}}$$

where:

E = sampling error in percent
SE = Unit total error for area or volume

For example, to compute the error on the area of timberland in the black-scarlet oak type in the Unit, proceed as follows:

The total area of black-scarlet oak type in the Unit from table 3 = 518,700 acres

The total area of all timberland in the Unit from table 3 = 2,092,700 acres

The Unit total error for timberland area from the above tabulation = 1.5 percent

Using the above formula:

$$\begin{aligned} \text{Error} &= \frac{(1.5) \sqrt{2,092,700}}{\sqrt{518,700}} \\ &= \pm 3.01 \text{ percent} \end{aligned}$$

SURVEY PROCEDURES

The 1989 Missouri survey used a growth model-enhanced, two-phase sample design. This sampling scheme and associated estimators are similar to sampling with partial replacement (SPR), in that a set of randomly located plots is available for remeasurement and a random set of new plots is established and measured. A significant feature of the new Missouri design is stratification for disturbance on the old sample and use of a growth model to improve regression estimates made on old undisturbed forest plots (fig. 7). The growth model used in the Missouri survey design was the Central States Stand and Tree Evaluation and Modeling System (STEMS)¹.

These were the major steps in the new survey design:

1. Aerial photography (Phase 1)

In this phase two sets of random points were located on current aerial photography. The first is a set of new photo plots and the second is a set of relocated old photo plots (ground plot locations from the previous inventory). Photos were 1:20,000 and 1:40,000 scale black and white panchromatic prints provided by the Agricultural Stabilization and Conservation Service and the Missouri Department of Natural Resources Geology and Land Survey. The year of photography for each county in the Unit is shown below.

¹ Shifley, S.F. 1987. A generalized system of models forecasting central states tree growth. Res. Pap. NC-279. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 10 p.

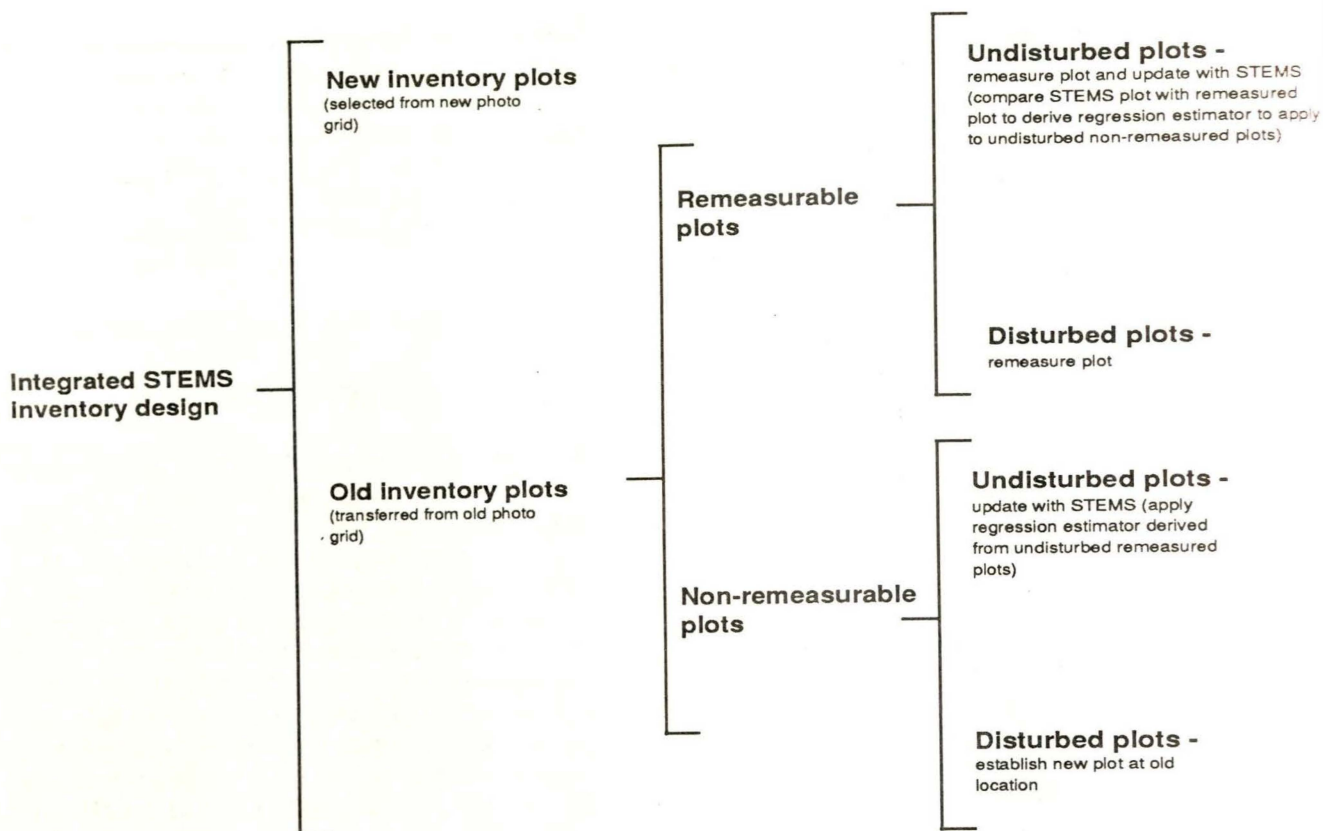


Figure 7.—Overview of the Missouri sample design.

County	Date	County	Date	County	Date
Boone	1977	Jefferson	1979	St. Charles	1980
Callaway	1982	Mississippi	1981	St. Louis	1980
Cape Girardeau	1981	Moniteau	1981	Ste. Genevieve	1981
Cole	1981	Montgomery	1979	Scott	1981
Dunklin	1981	New Madrid	1981	Stoddard	1981
Franklin	1980	Osage	1981	Warren	1980
Gasconade	1979	Pemiscot	1981	City of St. Louis	1980
Howard	1981	Perry	1981		

The locations of the plots used in the 1972 inventory were transferred to these new photographs. The photographs were then assembled into township mosaics, and a systematic grid of 121 one-acre photo plots (each plot representing approximately 190.4 acres) was overlaid on each township mosaic. Each of these plots (both the new systematic grid points and the old sample plots) was examined by aerial photogrammetrists

and classified stereoscopically based on land use. If trees were present, forest type and stand size-density class were recorded. Then all the old sample locations and a sample of the new photo plots were sent to the field for the field crew to verify the photo classification and to take further measurements. A total of 43,411 photo plots (40,849 new and 2,562 old) was examined stereoscopically:

Photo land class	Photo plots
Timberland	12,128
Reserved timberland	279
Questionable	52
Nonforest with trees	1,029
Nonforest without trees	29,257
Water	<u>666</u>
All classes	43,411

2. Plot measurements (Phase 2)

On plots classified as timberland, wooded pasture, or windbreak (at least 120 feet wide), a ground plot was established, remeasured, or modelled. Ground plots consist of a 10-point cluster covering approximately 1 acre. At each point, trees 5.0 inches or more in d.b.h. were sampled on a 37.5 Basal Area Factor (BAF) variable-radius plot, and trees less than 5.0 inches d.b.h. were sampled on a 1/300-acre fixed-radius plot.

From the new photo plots, a random sample of ground plots was established, and measures of land use, volume, mortality, and cutting were recorded. These locations were monumented for future remeasurement. The procedures for the old inventory photo plots (old plot locations) were somewhat different. Old plots were classed as remeasurable (monumented) or nonremeasurable (not monumented and thus difficult to relocate in the field). Within both of these groups, old plots can additionally be identified as undisturbed or disturbed. Ground plots corresponding to remeasurable old inventory photo plots that were classified as undisturbed forest land were remeasured to obtain current land use, volume, growth and removals information.

All undisturbed remeasurable forest plots were projected to the current time using STEMS, which yields projected estimates of current volume and growth. The comparison of the projected and observed values for these plots provided local calibration data to adjust the projected values of the undisturbed nonremeasurable plots. The adjustment procedure is

described by Smith² in a separate publication. All disturbed remeasurable plots were remeasured on the ground to assess changes since the last inventory. Disturbance refers to any change on a plot that can be detected on aerial photos and that the STEMS growth processor cannot predict, such as catastrophic mortality, cutting, seedling stands, and land use change.

Nonremeasurable forest plots were not monumented during the 1972 inventory, but play a crucial role in the new survey design. These points were carefully examined, comparing past and current aerial photography to determine which plots were undisturbed and had conditions that could be simulated by STEMS. For those plots that could be updated, past and current photography was examined to determine that only normal growth and mortality had occurred. STEMS was then used to "grow" the old plot and tree data to produce an estimate of current data. Thus, these plots were treated as ground plots, even though they were never visited. The plot record for each updated plot was sent to the field for verification of current ownership information. For plots classified as disturbed, a new ground plot was established as close to the old location as possible. This allows information about land use trend to be recorded even though it may not be possible to locate the old plot exactly.

The estimation procedure for computing statistics from this sampling design was more complicated than the simple two-phase estimation procedure used in the past. In fact, this procedure yielded two independent samples, one coming from the new photo points and the other from the old photo points that are remeasured or updated. The following tabulation summarizes the distribution of ground plots for the new inventory design:

² Smith, W. Brad. 1983. *Adjusting the STEMS regional growth models to improve local predictions*. Res. Note NC-297. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 5 p.

Ground land use class	Old plots remeasured	Old plots updated	Old plots replaced	New plots	Total plots
Timberland	329	50	70	226	675
Reserved timberland	4	0	0	29	33
Woodland	6	0	3	14	23
Reserved woodland	0	0	0	0	0
Nonforest with trees	17	11	10	39	77
Nonforest without trees	44	1,842	53	508	2,447
Water	1	37	0	19	57
Total	401	1,940	136	835	3,312

3. Area estimates

Area estimates were made using two-phase estimation methods. In this type of estimation, a preliminary estimate of area by land use is made from the aerial photographs (phase 1) and corrected by the plot measurements (phase 2). A complete description of this estimation method is presented by Loetsch and Haller³.

4. Volume estimates

Estimates of volume per acre were made from the trees measured or modelled on the 10-point plots. Estimates of volume per acre were multiplied by the area estimates to obtain estimates of total volume. Net cubic foot volumes are based on equations developed by Hahn and Hansen⁴ for use in the Central States.

The Forest Service reports all board foot volume in International 1/4-inch rule. In Missouri, the Doyle log rule is commonly used. Doyle log rule

conversion factors were derived from full tree measurements taken throughout the Central States (Illinois, Indiana, Iowa, and Missouri) and an equation developed by Wiant and Castenaeda⁵. The factors (multipliers) for converting board foot International volumes to the Doyle rule are shown in the following tabulation:

D.b.h. (inches)	Doyle rule conversion factor Softwoods	Hardwoods
9.0-10.9	0.3455	—
11.0-12.9	0.4780	0.4172
13.0-14.9	0.5992	0.5118
15.0-16.9	0.6908	0.5882
17.0-18.9	0.7685	0.6569
19.0-20.9	0.8573	0.7180
21.0-22.9	0.8645	0.7829
23.0-24.9	0.9276	0.8324
25.0-26.9	0.9493	0.8736
27.0-28.9	0.9710	0.9473
29.0+	1.1065	1.1349

³Loetsch, F.; Haller, K.E. 1964. Forest inventory. Volume I, Statistics of forest inventory and information from aerial photographs. BLV Verlagsgesellschaft Munch Basle Vienna. 436 p.

⁴Hahn, Jerold T.; Hansen, Mark H. (In prep.). Tree volume equations for the Central States. Res. Pap. NC-. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station.

⁵Wiant, Harry V., Jr.; Castenaeda, Froylan. 1977. Mesavage and Girard's volume tables formulated. BLM4. Denver, CO: U.S. Department of Interior, Bureau of Land Management, Denver Service Center: 1-4.

5. Growth and mortality estimates

On remeasured plots, estimates of growth and mortality per acre come from the remeasured diameters of trees and from observation of trees that died between inventories. Growth is reported for 1988, the last year before the inventory, and is based on an assumption of constant basal area growth over the remeasurement period. Mortality is reported for 1988 also, and is based on an assumption of constant volume mortality over the remeasurement period. On new plots, where trees were not remeasured, estimates of growth and mortality were obtained by using STEMS to project the growth and mortality of trees for 1 year. Growth and mortality estimates for old undisturbed plots that were updated were derived in the same manner as remeasured plots. The STEMS growth model was adjusted by Survey Unit to meet local conditions. As with volume, total growth and mortality estimates were obtained by multiplying the per acre estimates by area estimates.

6. Average annual removals estimates

Average annual growing-stock and sawtimber removals (1972 to 1988) were estimated only from the remeasured plots; new plots were not used to estimate removals. These estimates are obtained from trees measured in the last survey and cut or otherwise removed from the timberland base. Because remeasurement plots make up about one-half of the total ground plots, average annual removals estimates have greater sampling errors than volume and growth estimates.

COMPARING RIVERBORDER FOURTH INVENTORY WITH THE THIRD INVENTORY

The following paragraphs highlight some of the procedural changes since the last inventory and are provided to assist the reader in analyzing data from this report:

New volume equations were developed for the Central States, and these equations were used to compute the 1989 volumes and also to recompute the 1972 volume for growth calculations. Although the adjustment varies by Survey Unit, the recomputed 1972 growing-stock and board foot volumes will generally be greater than those shown in the 1972 report.

Mortality figures published in the 1972 inventory report were based on field estimates from a limited number of remeasurement plots. Information gathered on a larger number of remeasurement plots during the current inventory was used to adjust the 1972 mortality figures. This adjustment will also affect the estimate of net growth for the 1972 inventory.

Past surveys used only growing-stock trees to determine stand-size class. Current survey procedures require that stand-size class be determined on the basis of all live trees. Therefore, direct comparisons of current inventory data to old inventory data by stand-size class may be misleading.

The basic building block for estimating forest area and timber volume has been changed from the Survey Unit to the county. In the past, the statistics were developed at the Unit level and prorated back to the county on the basis of photo-interpretation points. Direct development of county-level data helps users interested in more precise local data, but can make the outcome of comparisons with past estimates uncertain.

LOG GRADE

In Missouri the butt log of every sawtimber sample tree was graded for quality on approximately one-third of the sample plots. The volume yield by log grade for species in this sample was used to distribute the volume of trees in the ungraded sample into log-grade classes by species group.

Logs were graded on the basis of external characteristics as indicators of quality. Hardwood species were graded according to "A guide to hardwood log grading"⁶. The best 12-foot section of the lowest 16-foot hardwood log, or the best 12-foot upper section if the butt log did not meet minimum log-grade standards, was graded as follows:

⁶Rast, Everette D.; Sonderman, David L.; Gammon, Glenn L. 1973. *A guide to hardwood log grading*. Gen. Tech. Rep. NE-1. Upper Darby, PA: U.S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station. 31 p.

Forest Service standard grades for hardwood factory saw logs

Grading factors		Specifications							
		Log grade 1			Log grade 2				Log grade 3
		Butts only	Butts & uppers		Butts & uppers				Butts & uppers
Position in tree									
Scaling diameter, inches		13-15 ¹	16-19	20+	11+ ²	12+			8+
Length without trim, feet			10+		10+	8-9	10-11	12+	8+
Required clear cuttings ³ of each of three best faces ⁴	Min. length, feet	7	5	3	3	3	3	3	2
	Max. number	2	2	2	2	2	2	3	No limit
	Min. proportion of log length required in clear cutting	5/6	5/6	5/6	2/3	3/4	2/3	2/3	1/2
Maximum sweep & crook allowance	For logs with less than one-fourth of end in sound defects		15 percent				30 percent		50 percent
	For logs with more than one-fourth of end in sound defects		10 percent				20 percent		35 percent
Maximum scaling deduction			40 percent ⁵				50 percent ⁶		50 percent

¹ Ash and basswood butts can be 12 inches if they otherwise meet requirements for small #1's.

² Ten-inch logs of all species can be #2 if they otherwise meet requirements for small #1's.

³ A clear cutting is a portion of a face, extending the width of the face, that is free of defects.

⁴ A face is one-fourth of the surface of the log as divided lengthwise.

⁵ Otherwise #1 logs with 41- to 60-percent deductions can be #2.

⁶ Otherwise #2 logs with 51- to 60-percent deductions can be #3.

Forest Service standard specifications for hardwood construction logs (tie and timber logs)¹

Position in tree	Butts and uppers
Min. diameter, small end	8 inches +
Min. length without trim	8 feet
Clear cuttings	No requirements
Sweep allowance	One-fourth of the diameter at the small end for each 8 feet of length.

Sound surface defects:

Single knots	Any number, if no one knot has an average diameter above the callus in excess of one-third of the log diameter at point of occurrence.
Whorled knots	Any number, if the sum of knot diameters above the callus does not exceed one-third of the log diameter at point of occurrence.
Holes	Any number provided none has a diameter over one-third of the log diameter at point of occurrence, and none extends more than 3 inches into included timber ² .

Unsound surface defects :	Same requirements as for sound defects if they extend into included timber. No limit if they do not.
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End defects:

Sound	No requirements.
Unsound	None allowed; log must be sound internally, but will admit one shake not to exceed one-fourth the scaling diameter and will admit one longitudinal split not extending more than 5 inches into included timber.

¹These specifications are minimum for the class. If, from a group of logs, factory logs are selected first, thus leaving only nonfactory logs from which to select construction logs, then the quality range of the construction logs so selected is limited, and the class may be considered a grade. If selection for construction logs is given first priority, it may be necessary to subdivide the class into grades.

²Included timber is always square, and dimension is judged from small end.

Log grades for southern pine logs

Grade 1: logs with three or four clear faces¹ and 16 inches minimum d.i.b.

Grade 2: logs with one or two clear faces and 12 inches minimum d.i.b.

Grade 3: logs with no clear faces and 6 inch minimum d.i.b.

After the tentative log grade is established from above, the log will be degraded one grade for each of the following, except that no log can be degraded below grade 3. Net scale after deduction for defect must be at least 50 percent of the gross contents of the log.

1. *Sweep.* Degrade any tentative 1 or 2 log one grade if sweep amounts to 3 or more inches and equals or exceeds one-third of the diameter inside bark at small end.
2. *Heart rot.* Degrade any tentative 1 or 2 log one grade if conk, massed hyphae, or other evidence of advanced heart rot is found anywhere in it.

¹A face is one-fourth of the circumference in width extending full length of the log. Clear faces are those free of: knots measuring more than 1 inch in diameter, overgrown knots of any size, and holes more than one inch in diameter. Faces may be rotated to obtain the maximum number of clear ones.

Log grades for eastern redcedar (Missouri special use)

Position in tree	Butts and uppers
D.B.H.	6 inches +
Min. diameter(ob), small end	5 inches +
Length without trim	7 feet
Clear cuttings	No requirements
Sweep allowance	Reasonably straight

Sound surface defects permitted:

Single knot	Any number less than one-half of the log diameter at point of occurrence.
Whorled knots	Any number provided the sum of the diameter of knots 2 inches or larger in a 1-foot section does not exceed the diameter at that point.

Unsound defects permitted:	Any number, provided defect is not greater than one-half of the volume at any one point of occurrence.
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METRIC EQUIVALENTS OF UNITS USED IN THIS REPORT

- 1 acre = 4,046.86 square meters or 0.405 hectare.
- 1,000 acres = 405 hectares.
- 1 cubic foot = 0.0283 cubic meter.
- 1 foot = 30.48 centimeters or 0.3048 meter.
- 1 inch = 25.4 millimeters, 2.54 centimeters, or 0.0254 meter.
- 1 pound = 0.454 kilograms.
- 1 ton = 0.907 metric tons.

TREE SPECIES GROUPS IN MISSOURI⁷

SOFTWOODS

Shortleaf pine *Pinus echinata*
Virginia pine *Pinus virginiana*
Baldcypress *Taxodium distichum*
Eastern redcedar *Juniperus virginiana*
Other softwoods

Scotch pine *Pinus sylvestris*

HARDWOODS

Select white oak⁸

White oak.....	<i>Quercus alba</i>
Swamp white oak	<i>Quercus bicolor</i>
Bur oak	<i>Quercus macrocarpa</i>
Swamp chestnut oak	<i>Quercus michauxii</i>
Chinkapin oak	<i>Quercus muehlenbergii</i>

Other white oak⁸

Overcup oak *Quercus lyrata*
Chestnut oak *Quercus prinus*
Post oak *Quercus stellata*

Select red oak⁸

Cherrybark oak *Quercus falcata*
var. *pagodifolia*
Northern red oak *Quercus rubra*
Shumard oak..... *Quercus shumardii*
var. *shumardii*

Other red oak⁸

Scarlet oak	<i>Quercus coccinea</i>
Northern pin oak	<i>Quercus ellipsoidalis</i>
Southern red oak	<i>Quercus falcata</i>
Shingle oak	<i>Quercus imbricaria</i>
Black oak	<i>Quercus velutina</i>
Blackjack oak	<i>Quercus marilandica</i>
Pin oak	<i>Quercus palustris</i>
Willow oak	<i>Quercus phellos</i>
Select hickory ⁸	
Pecan	<i>Carya illinoensis</i>
Shellbark hickory	<i>Carya laciniosa</i>
Shagbark hickory	<i>Carya ovata</i>
Mockernut hickory	<i>Carya tomentosa</i>

⁷ The common and scientific names are based on: Little, Elbert L. 1979. Checklist of native and naturalized trees of the United States. Agric. Handb. 541. Washington, DC: U.S. Department of Agriculture, Forest Service. 375 p.

⁸ This species or species group is considered a hard hardwood, with an average specific gravity greater than or equal to 0.50.

Other hickory⁸
 Bitternut hickory *Carya cordiformis*
 Pignut hickory *Carya glabra*
 Black hickory *Carya texana*
 River birch⁸ *Betula nigra*
 Hard maple⁸
 Sugar maple *Acer saccharum*
 Soft maple⁹
 Red maple *Acer rubrum*
 Silver maple *Acer saccharinum*
 Ash⁸
 Blue ash *Fraxinus quadrangulata*
 White ash *Fraxinus americana*
 Green ash *Fraxinus pennsylvanica*
 Cottonwood⁹ *Populus deltoides*
 Basswood⁹ *Tilia americana*
 Beech⁸ *Fagus grandifolia*
 Black walnut⁸ *Juglans nigra*
 Black cherry⁹ *Prunus serotina*
 Butternut⁹ *Juglans cinerea*
 Elm
 Winged elm⁹ *Ulmus alata*
 American elm⁹ *Ulmus americana*
 Slippery elm⁹ *Ulmus rubra*
 Rock elm⁸ *Ulmus thomasi*
 Hackberry⁹ *Celtis occidentalis*
 Sycamore⁹ *Platanus occidentalis*
 Yellow-poplar⁹ *Liriodendron tulipifera*
 Black willow⁹ *Salix nigra*
 Sweetgum⁹ *Liquidambar styraciflua*
 Tupelo⁹
 Black tupelo *Nyssa sylvatica*
 var. *sylvatica*
 Swamp tupelo *Nyssa sylvatica*
 var. *biflora*
 Persimmon⁸ *Diospyros virginiana*
 Sassafras⁹ *Sassafras albidum*
 Other hardwoods
 Ohio buckeye⁹ *Aesculus glabra*
 Boxelder⁹ *Acer negundo*
 Kentucky coffeetree⁸ *Gymnocladus dioica*
 Black locust⁸ *Robinia pseudoacacia*
 White mulberry⁹ *Morus alba*
 Red mulberry⁹ *Morus rubra*
 Honeylocust⁸ *Gleditsia triacanthos*
 Northern catalpa⁸ *Catalpa speciosa*

⁹ This species or species group is considered a soft hardwood, with an average specific gravity of 0.50 or less.

Noncommercial species

Osage-orange	<i>Maclura pomifera</i>
Eastern hophornbeam	<i>Ostrya virginiana</i>
Apple	<i>Malus</i> spp.
American hornbeam	<i>Carpinus caroliniana</i>
Wild plum	<i>Prunus</i> spp.
Eastern redbud	<i>Cercis canadensis</i>
Pawpaw	<i>Asimina triloba</i>
Hawthorn	<i>Crataegus</i> spp.

DEFINITION OF TERMS

Average annual removals from growing

stock.—The average net growing-stock volume in growing-stock trees removed annually for forest products (including roundwood products and logging residues) and for other uses (see Other removals). Average annual removals of growing stock are reported for a period of several years (1972 to 1988 in this report) and are based on information obtained from remeasurement plots (see Survey Procedures in Appendix).

Average annual removals from sawtimber.—

The average net board foot sawtimber volume of live sawtimber trees removed annually for forest products (including roundwood products and other uses [see Other removals]). Average annual removals of sawtimber are reported for a period of several years (1972 to 1988 in this report) and are based on information obtained from remeasurement plots (see Survey Procedures in Appendix).

Basal area.—The area in square feet of the cross section at breast height of a single tree. When the basal area of all trees in a stand is summed, the result is usually expressed as square feet of basal area per acre.

Commercial species.—Tree species presently or prospectively suitable for industrial wood products. (Note: Excludes species of typically small size, poor form, or inferior quality such as hophornbeam, osage-orange, and redbud.)

Commercial forest land.—(See Timberland).

Cord.—One standard cord is 128 cubic feet of stacked wood, including bark and air space. Cubic feet can be converted to standard cords by dividing by 79.

County and municipal land.—Land owned by counties and local public agencies or municipalities, or land leased to these governmental units for 50 years or more.

Cropland.—Land under cultivation within the past 24 months; including cropland harvested, crop failures, cultivated summer fallow, idle cropland used only for pasture, orchards, and land in soil improvement crops, but excluding land cultivated in developing improved pasture.

Cull.—Portions of a tree that are unusable for industrial wood products because of rot, missing or dead material, or other defect.

Diameter class.—A classification of trees based on diameter outside bark, measured at breast height (d.b.h.). Two-inch diameter classes are commonly used in Forest Inventory and Analysis, with the even inch the approximate midpoint for a class. For example, the 6-inch class includes trees 5.0 through 6.9 inches d.b.h.

Diameter at breast height (d.b.h.).—The outside bark diameter at 4.5 feet (1.37 m) above the forest floor on the uphill side of the tree. For determining breast height, the forest floor includes the duff layer that may be present, but does not include unincorporated woody debris that may rise above the ground line.

Farm.—Any place from which \$1,000 or more of agricultural products were produced and sold during the year.

Farmer-owned land.—Land owned by farm operators whether part of the farmstead or not. (Note: Excludes land leased by farm operators from nonfarm owners, such as railroad companies and States.)

Forest land.—Land at least 16.7 percent stocked by forest trees of any size, or formerly having had such tree cover, and not currently developed for nonforest use. (Note: Stocking is measured by comparing specified standards with basal area and/or number of trees, age or size, and spacing.) The minimum area for classification of forest land is 1 acre. Roadside, streamside, and shelterbelt strips of timber must have a crown width of at least 120 feet to qualify as forest land. Unimproved roads and trails, streams, or other bodies of water or clearings in forest areas shall be classed as forest if less than 120 feet wide. (See Tree, Land, Timberland, Reserved forest land, Other forest land, Stocking, and Water.)

Forest industry land.—Land owned by companies or individuals that operate a primary wood-using plant.

Forest type.—A classification of forest land based on the species forming a plurality of live tree stocking. Major forest types in the State are:

Shortleaf pine.—Forests in which shortleaf pine comprises a plurality of the stocking. (Common associates include oak, hickory, and gum.)

Eastern redcedar.—Forests in which eastern redcedar comprises a plurality of the stocking. (Common associates include oak and hickory.)

Eastern redcedar-hardwood.—Forests in which hardwoods (usually upland oaks), comprise a plurality of the stocking but where eastern redcedar comprises 25 to 50 percent of the stocking. (Common associates include gum, hickory, and yellow-poplar.)

Shortleaf pine-oak.—Forests in which hardwoods (usually white, scarlet, chestnut, northern red, or black oaks), singly or in combination, comprise a plurality of the stocking but where shortleaf pine comprises 25 to 50 percent of the stocking.

Post-blackjack oak.—Forests in which post or blackjack oaks, singly or in combination, comprise a plurality of the stocking, and less than 25 percent of the stocking is in pines or eastern redcedar.

Black-scarlet oak.—Forests in which black oak or scarlet oaks, singly or in combination, comprise a plurality of the stocking, and less than 25 percent of the stocking is in pines or eastern redcedar. (Common associates include yellow-poplar, elm, maple, and black walnut.)

White oak.—Forests in which white oak species, singly or in combination, comprise a plurality of the stocking, and less than 25 percent of the stocking is in pines or eastern redcedar.

Oak-gum-cypress.—Bottomland forests in which bottomland oaks such as pin, swamp white, and shingle oaks along with tupelo, blackgum, sweetgum, or cypress, singly or in combination, comprise a plurality of the stocking. (Common associates include cottonwood, willow, ash, elm, hackberry, and maple.)

Elm-ash-soft maple.—Forests in which lowland elm, ash, soft maple, and cottonwood, singly or in combination, comprise a plurality of the stocking. (Common associates include boxelder, willow, sycamore, and beech.)

Cottonwood.—Forests in which cottonwood comprises at least 50 percent of the stocking. (Associates include willow, elm, soft maple, and ash.)

Maple-beech.—Forests in which hard maple or beech, singly or in combination, comprises a plurality of the stocking. (Common associates include soft maple, elm, and basswood.)

Growing-stock tree.—A live tree of commercial species that meets specified standards of size, quality, and merchantability. (Note: Excludes rough, rotten, and dead trees.)

Growing-stock volume.—Net volume in cubic feet of growing-stock trees 5.0 inches d.b.h. and over, from 1 foot above the ground to a minimum 4.0-inch top diameter outside bark of the central stem or to the point where the central stem breaks into limbs.

Hard hardwoods.—Hardwood species with an average specific gravity greater than 0.50 such as oaks, hard maple, hickories, and ash.

Hardwoods.—Dicotyledonous trees, usually broad-leaved and deciduous. (See Soft hardwoods and Hard hardwoods.)

Idle farmland.—Includes former cropland, orchards, improved pastures, and farm sites not tended within the past 2 years and presently less than 16.7 percent stocked with trees.

Improved pasture.—Land currently improved for grazing by cultivating, seeding, irrigating, or clearing of trees or brush and less than 16.7 percent stocked with live trees.

Industrial wood.—All roundwood products, except fuelwood.

Land.—A. *Bureau of the Census.* Dry land and land temporarily or partly covered by water such as marshes, swamps, and river flood plains (omitting tidal flats below mean high tide); streams, sloughs, estuaries, and canals less than one-eighth of a statute mile wide; and lakes, reservoirs, and ponds less than 40 acres in area.

B. *Forest Inventory and Analysis.* The same as the Bureau of the Census, except minimum width of streams, etc., is 120 feet and minimum size of lakes, etc., is 1 acre.

Log grade.—A log classification based on external characteristics as indicators of quality or value. (See Appendix for specific grading factors used.)

Marsh.—Nonforest land that characteristically supports low, generally herbaceous or shrubby vegetation and that is intermittently covered with water.

Merchantable.—Refers to a pulpwood or saw-log section that meets pulpwood or saw-log specifications, respectively.

Miscellaneous Federal land.—Federal land other than National Forest and land administered by the Bureau of Land Management or Bureau of Indian Affairs.

Miscellaneous private land.—Privately owned land other than forest-industry and farmer-owned land.

Mortality.—The volume of sound wood in growing-stock and sawtimber trees that die annually.

National Forest land.—Federal land that has been legally designated as National Forest or purchase units, and other land administered by the USDA Forest Service.

Net annual growth of growing stock.—The annual change in volume of sound wood in live sawtimber and poletimber trees and the total volume of trees entering these classes through ingrowth, less volume losses resulting from natural causes.

Net annual growth of sawtimber.—The annual change in the volume of live sawtimber trees and the total volume of trees reaching sawtimber size, less volume losses resulting from natural causes.

Net volume.—Gross volume less deductions for rot, sweep, or other defect affecting use for timber products.

Noncommercial species.—Tree species of typically small size, poor form, or inferior quality that normally do not develop into trees suitable for industrial wood products.

Nonforest land.—Land that has never supported forests, and land formerly forested where use for timber management is precluded by development for other uses. (Note: Includes areas used for crops, improved pasture, residential areas, city parks, improved roads of any width and adjoining clearings, power-line clearings of any width, and 1- to 40-acre areas of water classified by the Bureau of the Census as land. If intermingled in forest areas, unimproved roads and nonforest strips must be more than 120 feet wide and more than 1 acre in area to qualify as nonforest land.)

a. *Nonforest land without trees.*—Nonforest land with no live trees present.

b. *Nonforest land with trees.*—Nonforest land with one or more trees per acre at least 5 inches d.b.h.

Nonstocked land.—Forest land less than 16.7 percent stocked with all live trees.

Other forest land.—Forest land not capable of producing 20 cubic feet per acre per year of industrial wood crops under natural conditions and not associated with urban or rural development. These sites often contain tree species that are not currently utilized for industrial wood production or trees of poor form, small size, or inferior quality that are unfit for industrial products. Unproductivity may be the result of adverse site conditions such as sterile soil, dry climate, poor drainage, high elevation, and rockiness. This land is not withdrawn from timber utilization.

Pasture.—Land presently used for grazing or under cultivation to develop grazing.

Pastured timberland.—Timberland for which the primary use is wood production, but is presently used for grazing.

Physiographic class.—A measure of soil and water conditions that affect tree growth on a site. The physiographic classes are:

Xeric sites.—Very dry soils where excessive drainage seriously limits both growth and species occurrence. Example: cedar barrens.

Xeromesic sites.—Moderately dry soils where excessive drainage limits growth and species occurrence to some extent. Example: dry oak ridge.

Mesic sites.—Deep, well-drained soils. Growth and species occurrence are limited only by climate.

Hydromesic sites.—Moderately wet soils where insufficient drainage or infrequent flooding limits growth and species occurrence to some extent. Example: better drained bottomland hardwood sites.

Hydric sites.—Very wet sites where excess water seriously limits both growth and species occurrence. Example: frequently flooded river bottoms and cypress swamps.

Poletimber stand.—(See Stand-size class.)

Poletimber tree.—A growing-stock tree of commercial species at least 5.0 inches d.b.h. but smaller than sawtimber size.

Reserved forest land.—Forest land withdrawn from timber utilization through statute, administrative regulation, designation, or exclusive use for Christmas tree production, as indicated by annual shearing.

Rotten tree.—A tree that does not meet regional merchantability standards because of excessive unsound cull. May include noncommercial tree species.

Rough tree.—A tree that does not meet regional merchantability standards because of excessive sound cull. May include noncommercial tree species.

Salvable dead tree.—A standing or down dead tree considered merchantable by regional standards.

Sapling.—A live tree 1.0 to 5.0 inches d.b.h.

Sapling-seedling stand.—(See Stand-size class.)

Saw log.—A log meeting minimum standards of diameter, length, and defect, including logs at least 8 feet long, sound and straight and with a minimum diameter outside bark (d.o.b.) for softwoods of 7.0 inches (9.0 inches for hardwoods) or other combinations of size and defect specified by regional standards.

Saw-log portion.—That part of the bole of sawtimber trees between the stump and the saw-log top.

Saw-log top.—The point on the bole of sawtimber trees above which a saw log cannot be produced. The minimum saw-log top is 7.0 inches d.o.b. for softwoods and 9.0 inches d.o.b. for hardwoods.

Sawtimber stand.—(See Stand-size class.)

Sawtimber tree.—A growing-stock tree of commercial species containing at least a 12-foot saw log or two noncontiguous saw logs 8 feet or longer, and meeting regional specifications for freedom from defect. Softwoods must be at least 9.0 inches d.b.h. Hardwoods must be at least 11.0 inches d.b.h.

Sawtimber volume.—Net volume of the saw-log portion of live sawtimber in board feet, International 1/4-inch rule (unless specified otherwise) from stump to a minimum 7.0 inches top d.o.b. for softwoods and a minimum 9.0 inches top d.o.b. for hardwoods.

Seedling.—A live tree less than 1.0 inch d.b.h. that is expected to survive. Only softwood seedlings more than 6 inches tall and hardwood seedlings more than 1 foot tall are counted.

Short-log (rough tree).—Sawtimber-size trees of commercial species that contain at least one merchantable 8- to 11-foot saw log but not a 12-foot saw log.

Site class.—A classification of forest lands in terms of inherent capacity to grow crops of industrial wood. The class identifies the potential growth in merchantable cubic feet/acre/year at culmination of mean annual increment of fully stocked natural stands.

Site index.—An expression of forest site quality based on the height of a free-growing dominant or codominant tree of a representative species in the forest type at age 50.

Soft hardwoods.—Hardwood species with an average specific gravity less than 0.50 such as gum, yellow-poplar, cottonwood, red maple, basswood, and willow.

Softwoods.—Coniferous trees, usually evergreen, having needles or scale-like leaves.

Stand.—A group of trees on a minimum of 1 acre of forest land that is stocked by forest trees of any size.

Stand-age class.—Age of the main stand. Main stand refers to trees of the dominant forest type and stand-size class.

Stand-size class.—A classification of stocked (see Stocking) forest land based on the size class of live trees on the area; that is, sawtimber, poletimber, or seedlings and saplings.

Sawtimber stands.—Stands with half or more of live stocking in sawtimber or poletimber trees, and with sawtimber stocking at least equal to poletimber stocking.

Poletimber stands.—Stands with half or more live stocking in poletimber and/or sawtimber trees, and with poletimber stocking exceeding that of sawtimber.

Sapling-seedling stands.—Stands with more than half of the live stocking in saplings and/or seedlings.

State land.—Land owned by States or leased to them for 50 years or more.

Stocking.—The degree of occupancy of land by trees, measured by basal area and/or the number of trees in a stand by size or age and spacing, compared to the basal area and/or number of trees required to fully utilize the growth potential of the land; that is, the stocking standard.

A stocking percent of 100 indicates full utilization of the site and is equivalent to 80 square feet of basal area per acre in trees 5.0 inches d.b.h. and larger. In a stand of trees less than 5.0 inches d.b.h., a stocking percent of 100 would indicate that the present number of trees is sufficient to produce 80 square feet of basal area per acre when the trees reach 5.0 inches d.b.h.

Stands are grouped into the following stocking classes:

Overstocked stands.—Stands in which stocking of live trees is 133 percent or more.

Fully stocked stands.—Stands in which stocking of trees is from 100.0 to 132.9 percent.

Medium stocked stands.—Stands in which stocking of trees is from 60.0 to 99.9 percent.

Poorly stocked stands.—Stands in which stocking of trees is from 16.7 to 59.9 percent.

Nonstocked areas.—Commercial forest land on which stocking of trees is less than 16.7 percent.

Timberland.—Forest land that is producing or capable of producing in excess of 20 cubic feet per acre per year of industrial wood crops under natural conditions, that is not withdrawn from timber utilization, and that is not associated with urban or rural development. Currently inaccessible and inoperable areas are included.

Tree.—A woody plant usually having one or more perennial stems, a more or less definitely formed crown of foliage, and a height of at least 12 feet at maturity.

Tree size class.—A classification of trees based on diameter at breast height, including sawtimber trees, poletimber trees, saplings, and seedlings.

Upper stem portion.—That part of the bole of sawtimber trees above the saw-log top to a minimum top diameter of 4.0 inches outside bark or to the point where the central stem breaks into limbs.

Urban and other areas.—Areas within the legal boundaries of cities and towns; suburban areas developed for residential, industrial, or recreational purposes; school yards; cemeteries; or other nonforest land not included in any other specified land use class.

Urban forest land.—Forest land closely associated with or in such proximity to urban nonforest land uses that is not likely to be managed for the production of industrial wood products on a continuing basis. Wood removed would be for land clearing, fuelwood, or aesthetic purposes. Such forest land may be associated with industrial, commercial, residential, or recreational nonforest uses. Residential subdivisions, industrial parks, golf course perimeters, airport buffer strips, and public urban parks that qualify as forest land are included.

Water.—Water Areas. Areas within a land mass persistently covered by water.

(a) *Bureau of the Census.*—Permanent inland water surfaces, such as lakes, reservoirs, and ponds at least 40 acres in area; and streams, sloughs, estuaries, and canals at least one-eighth of a statute mile wide.

(b) *Noncensus.*—Permanent inland water surfaces, such as lakes, reservoirs, and ponds from 1 to 39.9 acres in area; and streams, sloughs, estuaries, and canals from 120 feet to one-eighth of a statute mile wide.

Windbreak.—A group of trees whose primary use is to protect buildings currently in use.

Wooded pasture.—Improved pasture with more than 16.7 percent stocking in live trees but less than 25 percent stocking in growing-stock trees. Area is currently improved for grazing or there is other evidence of grazing.

Wooded strip.—An acre or more of natural continuous forest land that would otherwise meet survey standards for timberland except that it is less than 120 feet wide.

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Table 29.—Net volume of sawtimber on timberland by species group and forest type, Riverborder Unit, Missouri, 1989

Table 1.--Area of land by county and major land-use class, Riverborder Unit, Missouri, 1989

(In thousand acres)

County	Land area	Forest land					Nonforest land with trees	Nonforest land with trees, as a percent of land area
		All forest land	Timberland	Timberland as a percent of land area	Other forest land	Reserved forest land		
Boone	439.5	124.2	107.0	24.3	10.8	6.4	18.0	4.1
Callaway	539.1	192.3	181.3	33.6	11.0	--	35.4	6.6
Cape Girardeau	369.2	98.4	94.5	25.6	--	3.9	--	--
Cole	250.7	71.1	71.1	28.4	--	--	25.7	10.3
Dunklin	350.0	21.8	21.8	6.2	--	--	2.1	0.6
Franklin	590.0	257.1	248.3	42.1	3.5	5.3	35.7	6.1
Gasconade	333.3	161.3	139.9	42.0	21.4	--	18.1	5.4
Howard	297.3	60.4	60.4	20.3	--	--	15.1	5.1
Jefferson	423.1	227.9	222.5	52.6	5.4	--	32.0	7.6
Mississippi	262.3	14.4	13.7	5.2	--	0.7	--	--
Moniteau	266.7	54.6	54.6	20.5	--	--	5.8	2.2
Montgomery	345.7	103.7	98.5	28.5	5.2	--	16.8	4.9
New Madrid	421.3	18.9	18.9	4.5	--	--	--	--
Osage	387.6	162.4	141.7	36.6	20.7	--	22.3	5.8
Pemiscot	331.2	11.3	11.3	3.4	--	--	--	--
Perry	303.0	116.6	116.6	38.5	--	--	--	--
St. Charles	357.0	89.6	83.8	23.5	4.1	1.7	7.1	2.0
St. Louis	323.5	57.1	31.9	9.9	--	25.2	26.3	8.1
Ste. Genevieve	322.4	192.7	177.3	55.0	0.2	15.2	0.2	0.1
Scott	270.7	19.1	19.1	7.1	--	--	0.4	0.1
Stoddard	521.6	50.3	47.8	9.2	--	2.5	7.8	1.5
Warren	274.8	133.4	130.7	47.6	2.7	--	9.2	3.3
City of St. Louis	39.3	--	--	--	--	--	--	--
All counties	8,019.3	2,238.6	2,092.7	26.1	85.0	60.9	278.0	3.5

Table 2.--Area of timberland by county and ownership class, Riverborder Unit, Missouri, 1989

(In thousand acres)

County	All owners	Ownership class							
		National forest	Misc. federal	State	County & municipal	Forest industry	Farmer	Misc. private corporation	Misc. private individual
Boone	107.0	1.5	--	2.3	--	--	63.2	4.8	35.2
Callaway	181.3	6.6	--	--	--	--	67.4	11.8	95.5
Cape Girardeau	94.5	--	--	--	--	2.5	67.4	8.8	15.8
Cole	71.1	--	--	2.1	--	--	30.5	--	38.5
Dunklin	21.8	--	--	11.1	3.0	--	4.9	--	2.8
Franklin	248.3	--	--	9.6	--	--	87.3	20.3	131.1
Gasconade	139.9	--	--	--	--	--	66.1	4.6	69.2
Howard	60.4	--	--	6.8	--	--	34.0	--	19.6
Jefferson	222.5	--	--	4.5	--	--	44.7	43.5	129.8
Mississippi	13.7	--	--	--	--	--	5.9	1.0	6.8
Moniteau	54.6	--	--	--	--	--	40.5	--	14.1
Montgomery	98.5	--	--	5.8	--	--	31.4	2.9	58.4
New Madrid	18.9	--	--	5.5	--	--	6.5	4.6	2.3
Osage	141.7	--	1.7	--	--	--	73.7	--	66.3
Pemiscot	11.3	--	--	1.9	2.8	--	6.6	--	--
Perry	116.6	--	--	--	--	5.2	64.5	--	46.9
St. Charles	83.8	--	--	15.0	--	--	8.2	14.2	46.4
St. Louis	31.9	--	--	--	1.3	--	--	25.2	5.4
Ste. Genevieve	177.3	9.9	--	--	--	--	85.8	19.0	62.6
Scott	19.1	--	--	--	1.3	--	10.2	1.6	6.0
Stoddard	47.8	--	7.2	1.5	--	--	13.0	--	26.1
Warren	130.7	--	--	21.1	--	--	39.3	24.5	45.8
All counties	2,092.7	18.0	8.9	87.2	8.4	7.7	851.1	186.8	924.6

Table 3.--Area of timberland by county and forest type, Riverborder Unit, Missouri, 1989

(In thousand acres)

County	All types	Forest type											Non- ¹ stocked
		Short-leaf pine	Eastern redcedar	Eastern redcedar-hardwood	Shortleaf pine - oak	Post-blackjack oak	Black-scarlet oak	White oak	Oak-gum-cypress	Elm-ash-soft maple	Cottonwood	Maple-beech	
Boone	107.0	--	2.3	12.6	--	--	29.5	34.8	--	12.7	--	15.1	--
Callaway	181.3	--	--	19.1	--	2.5	68.6	73.2	--	1.7	--	16.2	--
Cape Girardeau	94.5	--	--	--	--	4.4	52.4	18.8	--	10.4	--	8.5	--
Cole	71.1	--	9.0	3.5	--	10.5	5.5	35.1	--	5.5	--	2.0	--
Dunklin	21.8	--	--	--	--	--	4.5	0.6	8.9	6.6	--	--	1.2
Franklin	248.3	--	18.1	24.0	--	64.3	49.0	70.4	--	13.3	--	9.2	--
Gasconade	139.9	--	5.6	10.7	--	40.9	26.1	51.5	--	2.3	--	2.8	--
Howard	60.4	--	--	4.0	--	--	8.1	28.8	--	5.1	--	14.4	--
Jefferson	222.5	--	19.2	30.0	--	59.0	39.5	51.1	--	5.6	--	18.1	--
Mississippi	13.7	--	--	--	--	--	--	--	2.5	11.2	--	--	--
Moniteau	54.6	--	2.0	3.7	--	7.8	11.3	22.0	--	--	--	7.8	--
Montgomery	98.5	--	--	11.4	--	9.7	30.5	38.9	--	--	--	5.1	2.9
New Madrid	18.9	--	--	--	--	--	--	--	--	16.6	--	2.3	--
Osage	141.7	--	8.0	13.2	--	30.2	25.5	55.1	--	3.9	--	5.8	--
Pemiscot	11.3	--	--	--	--	--	--	--	--	8.5	2.8	--	--
Perry	116.6	5.2	7.2	5.2	--	13.4	36.8	22.8	--	10.4	--	15.6	--
St. Charles	83.8	--	8.2	3.0	--	11.2	20.2	24.0	--	4.1	3.0	10.1	--
St. Louis	31.9	--	--	--	--	5.4	3.6	18.0	--	1.3	--	3.6	--
Ste. Genevieve	177.3	--	7.6	19.8	7.6	55.0	59.3	19.0	--	8.8	--	0.2	--
Scott	19.1	--	--	--	--	--	5.6	4.9	--	7.3	--	1.3	--
Stoddard	47.8	--	--	--	--	1.5	8.0	12.0	11.5	1.2	--	13.6	--
Warren	130.7	--	--	--	--	8.0	34.7	68.7	--	1.3	2.7	15.3	--
All counties	2,092.7	5.2	87.2	160.2	7.6	323.8	518.7	649.7	22.9	137.8	8.5	167.0	4.1

¹ Nonstocked with all live trees.

Table 4.--Area of timberland by county and stand-size class, Riverborder Unit,
Missouri, 1989

(In thousand acres)

County	All stands	Stand-size class			
		Sawtimber	Poletimber	Seedling & sapling	Non- stocked ¹
Boone	107.0	52.1	26.5	28.4	--
Callaway	181.3	92.8	66.0	22.5	--
Cape Girardeau	94.5	76.9	13.2	4.4	--
Cole	71.1	40.7	21.6	8.8	--
Dunklin	21.8	20.0	--	0.6	1.2
Franklin	248.3	149.6	73.7	25.0	--
Gasconade	139.9	61.7	65.2	13.0	--
Howard	60.4	35.2	17.1	8.1	--
Jefferson	222.5	116.2	54.2	52.1	--
Mississippi	13.7	13.7	--	--	--
Moniteau	54.6	20.0	24.0	10.6	--
Montgomery	98.5	65.7	29.9	--	2.9
New Madrid	18.9	17.4	--	1.5	--
Osage	141.7	73.6	45.4	22.7	--
Pemiscot	11.3	11.3	--	--	--
Perry	116.6	78.1	20.8	17.7	--
St. Charles	83.8	65.1	18.7	--	--
St. Louis	31.9	31.9	--	--	--
Ste. Genevieve	177.3	121.1	38.9	17.3	--
Scott	19.1	19.1	--	--	--
Stoddard	47.8	28.8	7.0	12.0	--
Warren	130.7	103.1	26.3	1.3	--
All counties	2,092.7	1,294.1	548.5	246.0	4.1

¹ Nonstocked with all live trees.

Table 5.--Area of timberland by county and site class, Riverborder Unit, Missouri, 1989

(In thousand acres)

County	All classes	Site class (cubic feet of growth per acre per year)				
		165+	120-164	85-119	50-84	20-49
Boone	107.0	--	--	13.3	62.4	31.3
Callaway	181.3	--	--	7.5	84.1	89.7
Cape Girardeau	94.5	3.5	--	8.5	78.1	4.4
Cole	71.1	--	--	6.1	13.7	51.3
Dunklin	21.8	--	--	6.0	5.7	10.1
Franklin	248.3	--	--	19.7	100.3	128.3
Gasconade	139.9	--	2.3	--	26.9	110.7
Howard	60.4	--	2.8	2.3	43.0	12.3
Jefferson	222.5	--	--	5.6	71.9	145.0
Mississippi	13.7	--	--	8.7	--	5.0
Moniteau	54.6	--	2.1	--	28.5	24.0
Montgomery	98.5	--	--	5.1	42.7	50.7
New Madrid	18.9	--	8.6	7.3	1.5	1.5
Osage	141.7	--	--	1.7	70.3	69.7
Pemiscot	11.3	--	4.7	3.8	2.8	--
Perry	116.6	--	10.4	5.2	54.5	46.5
St. Charles	83.8	--	3	10.1	38.2	32.5
St. Louis	31.9	--	--	--	17.5	14.4
Ste. Genevieve	177.3	--	--	--	77.8	99.5
Scott	19.1	--	--	10.4	8.7	--
Stoddard	47.8	13.6	1.2	4.0	16.5	12.5
Warren	130.7	--	--	17.5	52.6	60.6
All counties	2,092.7	17.1	35.1	142.8	897.7	1,000.0

Table 6.--Area of timberland by county and stocking class of growing-stock trees¹,
Riverborder Unit, Missouri, 1989

(In thousand acres)

County	All classes	Stocking percent of growing-stock trees				
		Non- stocked	Poorly stocked	Moderately stocked	Fully stocked	Over- stocked
Boone	107.0	--	35.4	67.0	4.6	--
Callaway	181.3	--	43.5	91.9	45.9	--
Cape Girardeau	94.5	--	17.5	61.2	15.8	--
Cole	71.1	--	32.1	37.0	2.0	--
Dunklin	21.8	1.2	11.0	5.3	4.3	--
Franklin	248.3	3.5	52.7	176.2	12.4	3.5
Gasconade	139.9	--	29.3	92.9	13.5	4.2
Howard	60.4	--	21.2	27.6	11.6	--
Jefferson	222.5	--	42.7	159.3	15.1	5.4
Mississippi	13.7	3.5	8.4	1.8	--	--
Moniteau	54.6	5.7	17.3	26.7	2.9	2.0
Montgomery	98.5	2.9	28.3	55.8	11.5	--
New Madrid	18.9	1.5	17.4	--	--	--
Osage	141.7	--	49.0	82.3	10.4	--
Pemiscot	11.3	--	5.6	3.8	1.9	--
Perry	116.6	--	23.7	66.9	26.0	--
St. Charles	83.8	--	7.1	58.4	14.2	4.1
St. Louis	31.9	1.3	12.6	10.8	7.2	--
Ste. Genevieve	177.3	3.8	47.8	105.4	19.8	0.5
Scott	19.1	--	2.6	14.5	2.0	--
Stoddard	47.8	1.5	11.7	20.3	14.3	--
Warren	130.7	--	32.5	73.5	22.0	2.7
All counties	2,092.7	24.9	549.4	1,238.6	257.4	22.4

¹ This table is based on the stocking percent of growing-stock trees rather than that of all live trees, therefore, to use the definitions of stocking for this table, replace the term "all live" by "growing-stock".

Table 7.--Area of timberland by ownership class and stocking class of growing-stock trees¹,
Riverborder Unit, Missouri, 1989

(In thousand acres)

Ownership class	All classes	Stocking percent of growing-stock trees				
		Non- stocked	Poorly stocked	Moderately stocked	Fully stocked	Over- stocked
National forest	18.0	--	4.0	13.5	--	0.5
Miscellaneous federal	8.9	--	2.9	1.5	4.5	--
State	87.2	--	16.3	48.3	22.6	--
County and municipal	8.4	2.5	4.6	--	1.3	--
Forest Industry	7.7	--	2.5	--	5.2	--
Farmer	851.1	17.0	252.4	492.4	81.1	8.2
Miscellaneous private corporation	186.8	1.0	39.6	111.2	25.5	9.5
Miscellaneous private individual	924.6	4.4	227.1	571.7	117.2	4.2
All owners	2,092.7	24.9	549.4	1,238.6	257.4	22.4

¹ This table is based on the stocking percent of growing-stock trees rather than that of all live trees, therefore, to use the definitions of stocking for this table, replace the term "all live" by "growing-stock".

Table 8.--Area of timberland by forest type and ownership class, Riverborder Unit, Missouri, 1989

(In thousand acres)

Forest type	All owners	Ownership class							
		National forest	Misc. federal	State	County & municipal	Forest industry	Farmer	Misc. private corporation	Misc. private individual
Shortleaf pine	5.2	--	--	--	--	--	--	--	5.2
Eastern redcedar	87.2	--	--	--	--	--	34.2	2.3	50.7
Eastern redcedar-hardwood	160.2	--	--	4.0	--	--	63.2	19.5	73.5
Shortleaf pine-oak	7.6	--	--	--	--	--	7.6	--	--
Post-blackjack oak	323.8	--	--	--	--	--	105.4	44.6	173.8
Black-scarlet oak	518.7	12.2	--	32.6	2.5	5.2	210.5	47.7	208.0
White oak	649.7	4.6	--	9.7	--	--	270.0	49.0	316.4
Oak-gum-cypress	22.9	--	6.0	10.4	--	--	1.5	--	5.0
Elm-ash-soft maple	137.8	--	2.9	21.0	1.9	2.5	73.8	12.8	22.9
Cottonwood	8.5	--	--	--	2.8	--	2.7	--	3.0
Maple-beech	167.0	1.2	--	9.5	--	--	82.2	10.9	63.2
Nonstocked	4.1	--	--	--	1.2	--	--	--	2.9
All types	2092.7	18.0	8.9	87.2	8.4	7.7	851.1	186.8	924.6

Table 9.--Area of timberland by forest type and stand-size class, Riverborder Unit, Missouri, 1989

(In thousand acres)

Forest type	All stands	Stand-size class			
		Sawtimber	Poletimber	Seedling & sapling	Non-stocked ¹
Shortleaf pine	5.2	--	5.2	--	--
Eastern redcedar	87.2	42.7	16.3	28.2	--
E. redcedar-hardwood	160.2	76.8	36.8	46.6	--
Shortleaf pine-oak	7.6	7.6	--	--	--
Post-blackjack oak	323.8	120.9	162.0	40.9	--
Black-scarlet oak	518.7	302.3	160.7	55.7	--
White oak	649.7	499.2	118.6	31.9	--
Oak-gum-cypress	22.9	18.9	2.5	1.5	--
Elm-ash-soft maple	137.8	122.9	5.8	9.1	--
Cottonwood	8.5	8.5	--	--	--
Maple-beech	167.0	94.3	40.6	32.1	--
Nonstocked	4.1	--	--	--	4.1
All types	2,092.7	1,294.1	548.5	246.0	4.1

¹ Nonstocked with all live trees.

Table 10.--Number of all live trees on timberland by species group and diameter class, Riverborder Unit, Missouri, 1989

(In thousand trees)

Species group	All classes	Diameter class (inches at breast height)											
		1.0- 2.9	3.0- 4.9	5.0- 6.9	7.0- 8.9	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 20.9	21.0- 28.9	29.0+
Softwoods													
White pine	1,677	--	285	296	350	208	364	146	28	--	--	--	--
Shortleaf pine	2,477	252	936	445	457	194	113	73	7	--	--	--	--
Other yellow pines	--	--	--	--	--	--	--	--	--	--	--	--	--
Baldcypress	296	--	--	48	--	27	--	30	39	58	16	74	4
Eastern redcedar	111,005	60,768	23,943	12,590	7,397	3,868	1,367	797	217	49	5	4	--
Other softwoods	162	--	--	49	113	--	--	--	--	--	--	--	--
Total	115,617	61,020	25,164	13,428	8,317	4,297	1,844	1,046	291	107	21	78	4
Hardwoods													
Select white oak	103,166	24,628	17,355	13,765	12,579	12,083	8,672	6,397	4,006	2,061	777	790	53
Other white oak	69,639	14,505	15,173	13,740	10,838	7,139	3,915	2,427	1,175	333	233	148	13
Select red oak	18,397	5,860	3,053	1,513	1,765	1,426	1,547	1,000	859	592	342	404	36
Other red oak	84,705	33,828	15,572	9,974	8,180	5,380	4,919	3,147	1,818	867	438	545	37
Select hickory	67,355	32,636	14,402	9,111	5,349	2,839	1,592	733	387	231	48	25	2
Other hickory	65,109	36,379	14,740	6,576	3,299	2,073	1,045	571	266	80	56	24	--
Basswood	2,442	1,464	558	95	100	136	49	7	--	19	6	8	--
Beech	394	303	21	26	--	--	5	7	14	6	3	7	2
Hard maple	71,990	50,049	12,285	4,086	2,555	1,446	819	420	192	69	45	20	4
Soft maple	13,793	7,195	2,316	2,055	861	571	342	207	80	65	27	62	12
Elm	113,242	81,088	19,780	7,080	3,370	1,019	460	197	132	71	18	25	2
Ash	63,190	35,832	13,546	5,491	3,352	1,821	1,612	832	428	139	66	64	7
Sycamore	3,210	498	1,092	45	342	231	271	175	185	142	75	137	17
Cottonwood	1,514	42	295	144	74	82	165	213	104	76	90	138	91
Willow	3,314	111	--	239	402	266	564	528	449	336	220	192	7
Hackberry	21,423	13,887	3,813	1,583	878	560	333	207	52	58	13	33	6
Aspen	31	--	--	--	--	31	--	--	--	--	--	--	--
Birch	741	--	144	179	86	135	88	57	4	23	--	25	--
Sweetgum	1,597	570	746	--	54	97	21	16	54	11	17	11	--
Tupelo	5,961	3,141	1,194	494	386	158	321	151	51	47	11	4	3
Black cherry	11,294	7,842	1,722	845	431	169	117	60	63	38	--	7	--
Black walnut	9,676	2,262	1,836	1,677	1,642	946	572	289	236	124	66	26	--
Butternut	714	300	279	96	39	--	--	--	--	--	--	--	--
Yellow-poplar	660	315	195	24	42	9	41	13	3	3	10	1	4
Persimmon	18,362	10,106	5,979	1,857	380	--	23	17	--	--	--	--	--
Sassafras	19,695	14,187	3,654	1,378	326	71	52	--	4	10	--	13	--
Other hardwoods	94,295	71,136	14,186	3,776	2,285	1,337	769	382	190	129	50	55	--
Noncommercial sp.	63,815	55,350	6,453	1,533	421	46	12	--	--	--	--	--	--
Total	929,724	503,514	170,389	87,382	60,036	40,071	28,326	18,053	10,752	5,530	2,611	2,764	296
All species	1,045,341	564,534	195,553	100,810	68,353	44,368	30,170	19,099	11,043	5,637	2,632	2,842	300

Table 11.--Number of growing-stock trees on timberland by species group and diameter class, Riverborder Unit, Missouri, 1989

(In thousand trees)

Species group	All classes	Diameter class (inches at breast height)											
		1.0- 2.9	3.0- 4.9	5.0- 6.9	7.0- 8.9	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 20.9	21.0- 28.9	29.0+
Softwoods													
White pine	1,677	--	285	296	350	208	364	146	28	--	--	--	--
Shortleaf pine	2,233	252	810	363	457	187	97	60	--	--	--	--	--
Other yellow pines	--	--	--	--	--	--	--	--	--	--	--	--	--
Baldcypress	195	--	--	--	--	1	--	1	1	52	1	69	4
Eastern redcedar	105,597	60,768	22,959	10,618	6,279	3,208	1,041	533	133	49	--	--	--
Other softwoods	113	--	--	--	113	--	--	--	--	--	--	--	--
Total	109,815	61,020	24,054	11,277	7,199	3,619	1,502	758	191	101	1	73	4
Hardwoods													
Select white oak	77,812	24,048	13,080	9,262	7,624	7,854	6,213	4,715	2,844	1,347	457	359	9
Other white oak	54,417	14,505	12,777	9,940	7,968	4,685	2,567	1,192	533	116	93	38	3
Select red oak	13,990	5,510	2,505	1,065	1,400	873	878	649	437	304	163	186	20
Other red oak	69,855	33,828	12,455	6,868	5,775	3,616	3,309	1,868	1,172	472	238	241	13
Select hickory	59,357	31,866	12,329	7,145	3,805	2,015	1,153	539	289	156	42	1	2
Other hickory	57,245	36,379	12,061	3,781	2,086	1,474	688	420	242	69	32	1	--
Basswood	1,890	1,464	306	48	--	40	--	--	--	--	--	--	--
Beech	361	303	21	26	--	--	--	--	--	--	--	--	--
Hard maple	64,383	49,719	9,750	2,688	1,018	583	381	138	68	1	1	--	--
Soft maple	11,213	6,945	1,779	1,270	586	257	140	109	51	28	--	38	1
Elm	99,729	80,838	12,858	3,553	1,524	494	297	47	79	27	--	1	--
Ash	49,865	35,742	8,211	1,940	1,605	805	830	383	217	69	33	1	7
Sycamore	2,330	498	759	1	190	166	233	106	84	114	66	90	12
Cottonwood	1,081	42	45	99	74	82	124	177	90	59	77	138	74
Willow	2,202	111	--	167	286	128	306	355	317	239	162	130	1
Hackberry	18,480	13,803	2,538	1,082	436	309	160	56	37	34	1	1	--
Aspen	31	--	--	--	--	31	--	--	--	--	--	--	--
Birch	662	--	144	179	86	92	73	57	--	1	--	--	--
Sweetgum	1,294	570	545	--	13	57	14	8	54	--	1	--	--
Tupelo	4,687	3,141	753	309	--	158	165	93	34	31	--	--	--
Black cherry	9,486	7,842	714	676	99	78	14	--	39	1	--	--	--
Black walnut	5,243	2,262	639	530	658	482	300	152	114	67	28	--	--
Butternut	414	300	75	--	39	--	--	--	--	--	--	--	--
Yellow-poplar	660	315	195	24	42	9	41	13	3	3	--	--	4
Persimmon	13,498	9,606	2,691	962	222	--	--	17	--	--	--	--	--
Sassafras	16,873	14,187	2,031	547	84	--	24	--	--	--	--	--	--
Other hardwoods	79,246	70,656	6,249	691	686	502	246	76	46	51	30	1	--
Total	716,304	444,480	115,510	52,864	36,306	24,790	18,170	11,177	6,754	3,258	1,490	1,359	146
All species	826,119	505,500	139,564	64,141	43,505	28,409	19,672	11,935	6,945	3,359	1,507	1,432	150

Table 12.--Net volume of timber on timberland by class of timber and species group,
Riverborder Unit, Missouri, 1989

(In thousand cubic feet)

Class of timber	All species	Species group			
		Pine	Other softwoods	Soft hardwoods	Hard hardwoods
Live trees					
Growing-stock trees					
Sawtimber					
Saw-log portion	986,461	14,074	57,643	171,779	742,965
Upper stem portion	181,145	1,972	7,566	21,199	150,408
Total	1,167,606	16,046	65,209	192,978	893,373
Poletimber	575,141	6,462	48,227	48,670	471,782
All growing-stock trees	1,742,747	22,508	113,436	241,648	1,365,155
Cull trees					
Short-log trees	161,577	257	2,817	23,208	135,295
Rough trees					
Sawtimber	290,868	302	11,263	35,035	244,268
Poletimber	257,883	328	8,078	31,753	217,724
Total	548,751	630	19,341	66,788	461,992
Rotten trees					
Sawtimber	101,800	--	1,598	13,020	87,182
Poletimber	16,373	--	114	2,444	13,815
Total	118,173	--	1,712	15,464	100,997
All cull trees	828,501	887	23,870	105,460	698,284
All live trees	2,571,248	23,395	137,306	347,108	2,063,439
Salvable dead trees					
Sawtimber	9,148	--	407	1,282	7,459
Poletimber	7,682	--	1,404	3,704	2,574
Total	16,830	--	1,811	4,986	10,033
All classes of timber	2,588,078	23,395	139,117	352,094	2,073,472

Table 13.--Net volume of growing-stock trees on timberland by species group and diameter class, Riverborder Unit, Missouri, 1989

(In thousand cubic feet)

Species group	All classes	Diameter class (inches at breast height)									
		5.0- 6.9	7.0- 8.9	9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 20.9	21.0- 28.9	29.0+
Softwoods											
White pine	13,843	935	1,528	1,836	5,660	3,048	836	--	--	--	--
Shortleaf pine	8,203	1,089	2,448	1,597	1,418	1,400	251	--	--	--	--
Other yellow pines	--	--	--	--	--	--	--	--	--	--	--
Baldcypress	12,600	--	--	145	--	389	680	2,338	726	7,325	997
Eastern redcedar	100,836	21,737	26,490	24,891	12,858	9,507	3,368	1,527	213	245	--
Other softwoods	462	--	462	--	--	--	--	--	--	--	--
Total	135,944	23,761	30,928	28,469	19,936	14,344	5,135	3,865	939	7,570	997
Hardwoods											
Select white oak	511,439	22,114	38,155	70,680	90,129	100,275	84,047	53,510	23,841	27,450	1,238
Other white oak	181,430	21,513	36,728	38,359	34,352	23,924	14,690	4,290	4,434	2,800	340
Select red oak	97,665	2,771	7,026	8,315	13,346	14,039	13,736	12,641	8,515	14,154	3,122
Other red oak	255,310	16,354	28,046	32,425	48,162	40,324	35,469	19,489	13,187	19,974	1,880
Select hickory	105,783	16,263	19,768	18,989	17,770	12,221	9,886	6,841	2,541	1,189	315
Other hickory	69,155	8,795	10,402	13,812	11,134	10,153	8,633	3,170	1,829	1,227	--
Basswood	1,906	97	--	448	161	174	--	278	355	393	--
Beech	513	62	--	--	104	--	--	202	71	74	--
Hard maple	32,670	6,887	5,674	5,921	6,397	3,308	2,368	873	822	420	--
Soft maple	21,577	3,278	3,113	2,580	2,303	2,646	1,739	1,223	588	3,943	164
Elm	27,882	7,354	6,474	3,880	4,053	932	2,498	1,133	--	1,558	--
Ash	56,460	4,080	8,274	7,679	12,668	8,760	7,101	2,933	1,993	1,993	979
Sycamore	37,405	48	1,243	1,919	3,964	2,846	3,305	6,144	4,814	10,114	3,008
Cottonwood	51,343	266	476	864	2,154	4,433	3,416	2,898	4,731	14,756	17,349
Willow	63,433	577	1,786	1,405	4,998	9,219	11,463	11,901	10,292	11,566	226
Hackberry	14,128	2,058	2,111	2,559	2,232	1,168	1,099	1,347	721	833	--
Aspen	393	--	--	393	--	--	--	--	--	--	--
Birch	5,654	376	420	742	1,154	1,359	146	827	--	630	--
Sweetgum	4,773	--	47	551	209	188	1,713	315	1,002	748	--
Tupelo	9,449	701	--	1,316	2,425	2,171	1,147	1,332	--	357	--
Black cherry	5,550	1,282	532	739	181	--	1,367	700	--	749	--
Black walnut	23,823	1,097	3,160	4,103	4,112	3,089	3,383	2,725	1,461	693	--
Butternut	170	--	170	--	--	--	--	--	--	--	--
Yellow-poplar	3,639	78	224	101	799	367	98	149	682	193	948
Persimmon	2,890	1,699	848	--	--	343	--	--	--	--	--
Sassafras	1,773	1,065	327	--	381	--	--	--	--	--	--
Other hardwoods	20,590	1,327	3,114	4,412	3,676	1,616	1,540	2,329	1,686	890	--
Total	1,606,803	120,142	178,118	222,192	266,864	243,555	208,844	137,250	83,565	116,704	29,569
All species	1,742,747	143,903	209,046	250,661	286,800	257,899	213,979	141,115	84,504	124,274	30,566

Table 14.--Net volume of growing stock in the saw-log portion of sawtimber trees on timberland by species group and diameter class, Riverborder Unit, Missouri, 1989

(In thousand cubic feet)

Species group	All classes	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods									
White pine	10,028	1,458	5,000	2,784	786	--	--	--	--
Shortleaf pine	4,046	1,267	1,246	1,295	238	--	--	--	--
Other yellow pines	--	--	--	--	--	--	--	--	--
Baldcypress	12,261	118	--	355	641	2,248	706	7,201	992
Eastern redcedar	45,382	20,222	11,350	8,738	3,173	1,456	205	238	--
Other softwoods	--	--	--	--	--	--	--	--	--
Total	71,717	23,065	17,596	13,172	4,838	3,704	911	7,439	992
Hardwoods									
Select white oak	318,022	--	65,785	81,793	72,917	48,228	22,039	26,059	1,201
Other white oak	66,604	--	24,063	19,128	12,549	3,824	4,065	2,646	329
Select red oak	69,777	--	10,089	11,631	12,106	11,515	7,915	13,472	3,049
Other red oak	150,142	--	35,298	33,110	30,918	17,664	12,277	19,047	1,828
Select hickory	40,818	--	12,554	9,782	8,572	6,140	2,348	1,116	306
Other hickory	29,623	--	8,055	8,287	7,555	2,867	1,692	1,167	--
Basswood	1,249	--	129	150	--	256	335	379	--
Beech	408	--	85	--	--	186	66	71	--
Hard maple	11,510	--	4,761	2,718	2,071	789	766	405	--
Soft maple	10,990	--	1,696	2,174	1,518	1,106	551	3,785	160
Elm	8,280	--	2,832	739	2,178	1,021	--	1,510	--
Ash	29,890	--	9,205	7,152	6,190	2,646	1,851	1,894	952
Sycamore	31,156	--	2,948	2,391	2,945	5,663	4,524	9,733	2,952
Cottonwood	47,003	--	1,692	3,770	3,076	2,682	4,448	14,254	17,081
Willow	51,776	--	3,407	7,368	9,814	10,647	9,445	10,876	219
Hackberry	6,112	--	1,577	936	941	1,209	664	785	--
Aspen	--	--	--	--	--	--	--	--	--
Birch	3,382	--	817	1,101	128	744	--	592	--
Sweetgum	3,680	--	149	152	1,472	282	925	700	--
Tupelo	5,946	--	1,677	1,741	995	1,189	--	344	--
Black cherry	2,652	--	118	--	1,194	625	--	715	--
Black walnut	12,610	--	2,839	2,439	2,902	2,443	1,344	643	--
Butternut	--	--	--	--	--	--	--	--	--
Yellow-poplar	2,935	--	634	315	88	137	641	188	932
Persimmon	267	--	--	267	--	--	--	--	--
Sassafras	272	--	272	--	--	--	--	--	--
Other hardwoods	9,640	--	2,562	1,264	1,332	2,098	1,554	830	--
Total	914,744	--	193,244	198,408	181,461	123,961	77,450	111,211	29,009
All species	986,461	23,065	210,840	211,580	186,299	127,665	78,361	118,650	30,001

Table 15.--Net volume of sawtimber trees on timberland by species group and diameter class, Riverborder Unit, Missouri, 1989

(In thousand board feet)¹

Species group	All classes	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods									
White pine	54,123	8,446	26,882	14,696	4,099	--	--	--	--
Shortleaf pine	23,692	7,802	7,133	7,403	1,354	--	--	--	--
Other yellow pines	--	--	--	--	--	--	--	--	--
Baldcypress	61,836	607	--	1,740	3,159	11,110	3,506	37,003	4,711
Eastern redcedar	274,255	137,382	66,257	46,349	15,561	6,790	907	1,009	--
Other softwoods	--	--	--	--	--	--	--	--	--
Total	413,906	154,237	100,272	70,188	24,173	17,900	4,413	38,012	4,711
Hardwoods									
Select white oak	1,804,232	--	441,259	483,229	397,397	248,651	108,707	120,070	4,919
Other white oak	417,709	--	169,825	118,036	72,401	20,991	21,553	13,400	1,503
Select red oak	392,549	--	66,280	70,205	68,714	63,052	42,254	68,466	13,578
Other red oak	876,744	--	238,825	200,246	175,824	95,861	64,043	93,826	8,119
Select hickory	245,933	--	85,857	59,261	47,938	33,242	12,324	5,777	1,534
Other hickory	179,673	--	55,280	50,406	43,028	15,775	9,123	6,061	--
Basswood	6,662	--	811	876	--	1,380	1,734	1,861	--
Beech	2,228	--	527	--	--	997	346	358	--
Hard maple	67,295	--	30,510	15,733	11,310	4,124	3,872	1,746	--
Soft maple	54,578	--	10,014	11,586	7,648	5,375	2,568	16,733	654
Elm	46,005	--	18,848	4,281	11,594	5,090	--	6,192	--
Ash	168,487	--	57,387	40,578	33,431	13,933	9,513	9,389	4,256
Sycamore	159,693	--	17,620	13,206	15,346	29,297	23,173	48,010	13,041
Cottonwood	242,423	--	10,307	21,703	17,264	14,954	24,573	76,090	77,532
Willow	271,333	--	22,898	42,455	52,866	54,852	46,816	50,605	841
Hackberry	33,872	--	10,358	5,562	5,006	6,130	3,231	3,585	--
Aspen	--	--	--	--	--	--	--	--	--
Birch	18,636	--	5,277	6,231	663	3,709	--	2,756	--
Sweetgum	18,752	--	963	860	7,767	1,425	4,453	3,284	--
Tupelo	33,786	--	11,133	9,928	5,222	6,038	--	1,465	--
Black cherry	13,420	--	834	--	6,200	3,195	--	3,191	--
Black walnut	73,130	--	19,662	14,739	16,028	12,843	6,782	3,076	--
Butternut	--	--	--	--	--	--	--	--	--
Yellow-poplar	15,895	--	3,893	1,907	518	768	3,508	995	4,306
Persimmon	1,566	--	--	1,566	--	--	--	--	--
Sassafras	1,761	--	1,761	--	--	--	--	--	--
Other hardwoods	53,278	--	16,925	7,424	7,025	10,457	7,506	3,941	--
Total	5,199,640	--	1,297,054	1,180,018	1,003,190	652,139	396,079	540,877	130,283
All species	5,613,546	154,237	1,397,326	1,250,206	1,027,363	670,039	400,492	578,889	134,994

¹ International 1/4-inch rule.

Table 16.--Net volume of growing stock and sawtimber on timberland by county and species group, Riverborder Unit, Missouri, 1989

County	Growing stock					Sawtimber				
	All species	Species group				All species	Species group			
		Pine	Other softwoods	Soft hardwoods	Hard hardwoods		Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	----- Thousand cubic feet -----					----- Thousand board feet ¹ -----				
Boone	61,207	--	2,665	11,999	46,543	175,079	--	10,529	36,253	128,297
Callaway	143,392	--	7,671	7,957	127,764	400,412	--	18,574	19,802	362,036
Cape Girardeau	107,362	--	--	16,102	91,260	411,384	--	--	65,747	345,637
Cole	45,416	--	6,399	9,139	29,878	133,375	--	15,503	31,795	86,077
Dunklin	30,544	--	7,596	11,184	11,764	118,487	--	36,929	36,638	44,920
Franklin	180,014	--	17,775	9,030	153,209	554,062	--	50,560	27,644	475,858
Gasconade	104,890	--	7,402	6,420	91,068	296,894	--	13,262	19,634	263,998
Howard	42,903	--	1,559	6,885	34,459	130,371	--	3,081	19,103	108,187
Jefferson	165,639	1,168	19,680	12,294	132,497	511,837	3,759	55,869	45,544	406,665
Mississippi	22,334	--	3,117	14,072	5,145	96,490	--	15,399	59,690	21,401
Moniteau	30,488	--	1,769	1,287	27,432	73,413	--	4,824	3,768	64,821
Montgomery	78,672	--	4,597	2,268	71,807	227,191	--	13,322	3,955	209,914
New Madrid	19,343	--	--	14,911	4,432	77,970	--	--	61,430	16,540
Osage	93,572	--	6,351	2,458	84,763	254,104	--	14,766	3,467	235,871
Pemiscot	18,029	--	--	17,712	317	74,555	--	--	73,027	1,528
Perry	124,102	3,683	6,653	26,654	87,112	429,797	4,475	24,447	110,204	290,671
St. Charles	108,271	--	8,429	20,650	79,192	373,763	--	27,637	75,839	270,287
St. Louis	33,121	--	--	1,072	32,049	126,078	--	--	4,103	121,975
Ste. Genevieve	118,179	3,814	7,075	4,782	102,508	361,881	15,458	13,952	14,981	317,490
Scott	30,544	--	716	16,382	13,446	125,661	--	3,717	67,042	54,902
Stoddard	48,055	--	1,171	8,067	38,817	171,129	--	5,791	32,107	133,231
Warren	136,670	13,843	2,811	20,323	99,693	489,613	54,123	7,929	84,646	342,915
All counties	1,742,747	22,508	113,436	241,648	1,365,155	5,613,546	77,815	336,091	896,419	4,303,221

¹ International 1/4-inch rule.

Table 17.--Net volume of live trees and growing stock on timberland by ownership class and species group, Riverborder Unit, Missouri, 1989

(In thousand cubic feet)

Ownership class	Live trees					Growing stock				
	All species	Species group				All species	Species group			
		Pine	Other softwoods	Soft hardwoods	Hard hardwoods		Pine	Other softwoods	Soft hardwoods	Hard hardwoods
National forest	20,975	--	338	919	19,718	13,995	--	338	229	13,428
Miscellaneous federal	11,223	--	364	1,997	8,862	8,584	--	328	1,066	7,190
State	140,135	13,843	13,421	41,633	71,238	109,403	13,843	12,501	30,167	52,892
County and municipal	7,071	--	--	3,762	3,309	5,748	--	--	3,006	2,742
Forest industry	14,135	--	--	2,499	11,636	11,913	--	--	1,665	10,248
Farmer	1,038,461	4,863	42,399	187,672	803,527	691,263	4,606	33,549	128,766	524,342
Miscellaneous private corporation	228,322	247	7,177	23,665	197,233	154,088	--	5,374	16,769	131,945
Miscellaneous private individual	1,110,926	4,442	73,607	84,961	947,916	747,753	4,059	61,346	59,980	622,368
All owners	2,571,248	23,395	137,306	347,108	2,063,439	1,742,747	22,508	113,436	241,648	1,365,155

Table 18.--Net volume of sawtimber trees on timberland by species group and butt log grade,
Riverborder Unit, Missouri, 1989

(In thousand board feet)¹

Species group	All	Butt log grade			
	grades	1	2	3	Tie and timber
Softwoods					
White pine	54,123	2,452	525	45,160	5,986
Shortleaf pine	23,692	--	23,692	--	--
Other yellow pines	--	--	--	--	--
Baldcypress	61,836	--	2,462	59,374	--
Eastern redcedar	274,255	--	--	274,255	--
Other softwoods	--	--	--	--	--
Total	413,906	2,452	26,679	378,789	5,986
Hardwoods					
Select white oak	1,804,232	91,885	401,962	819,193	491,193
Other white oak	417,709	4,755	45,325	133,856	233,772
Select red oak	392,549	40,034	48,607	98,212	205,696
Other red oak	876,744	20,035	73,460	221,798	561,451
Select hickory	245,933	8,868	43,405	54,094	139,567
Other hickory	179,673	9,403	23,514	42,185	104,570
Basswood	6,662	--	4,900	1,762	--
Beech	2,228	--	--	434	1,794
Hard maple	67,295	--	585	7,823	58,887
Soft maple	54,578	2,358	3,165	18,267	30,788
Elm	46,005	0	3,590	15,770	26,645
Ash	168,487	8,130	72,102	67,641	20,613
Sycamore	159,693	61,852	27,231	49,639	20,971
Cottonwood	242,423	5,639	50,439	36,279	150,067
Willow	271,333	3,550	16,727	118,753	132,303
Hackberry	33,872	0	4,133	13,494	16,245
Aspen	--	--	--	--	--
Birch	18,636	3,954	--	9,994	4,689
Sweetgum	18,752	8,112	--	4,489	6,150
Tupelo	33,786	5,851	5,475	3,466	18,994
Black cherry	13,420	4,714	8,706	--	--
Black walnut	73,130	8,213	17,464	41,599	5,854
Butternut	--	--	--	--	--
Yellow-poplar	15,895	--	--	15,895	--
Persimmon	1,566	--	--	1,566	--
Sassafras	1,761	--	--	1,761	--
Other hardwoods	53,278	--	12,087	12,839	28,351
Total	5,199,640	287,352	862,878	1,790,810	2,258,601
All species	5,613,546	289,803	889,557	2,169,599	2,264,587

¹ International 1/4-inch rule.

² Includes 12,044 thousand board feet of volume from sawtimber-sized, Grade 5 eastern redcedar trees graded for special use. (See Log Grades for Eastern Redcedar in the Appendix.)

Table 19.--Net annual growth of growing stock and sawtimber on timberland by county and species group, Riverborder Unit, Missouri, 1989

County	Growing stock					Sawtimber				
	All species	Species group				All species	Species group			
		Pine	Other softwoods	Soft hardwoods	Hard hardwoods		Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	----- Thousand cubic feet -----					----- Thousand board feet ¹ -----				
Boone	1,540	--	76	388	1,076	4,175	--	283	1,018	2,874
Callaway	6,301	--	181	186	5,934	21,417	--	235	425	20,757
Cape Girardeau	2,899	--	--	553	2,346	16,302	--	--	1,569	14,733
Cole	1,304	--	204	236	864	4,079	--	440	447	3,192
Dunklin	915	--	151	198	566	3,423	--	803	908	1,712
Franklin	4,598	--	701	352	3,545	17,977	--	1,327	1,771	14,879
Gasconade	2,327	--	338	175	1,814	11,737	--	2,264	412	9,061
Howard	1,176	--	104	195	877	7,806	--	171	568	7,067
Jefferson	3,079	21	345	337	2,376	19,121	48	2,192	928	15,953
Mississippi	310	--	25	224	61	1,908	--	145	1,379	384
Moniteau	732	--	117	3	612	1,404	--	204	-125	1,325
Montgomery	1,820	--	158	165	1,497	9,607	--	510	326	8,771
New Madrid	484	--	--	367	117	1,939	--	--	1,396	543
Osage	2,515	--	238	58	2,219	7,624	--	277	34	7,313
Pemiscot	132	--	--	138	-6	1,716	--	--	1,710	6
Perry	2,721	183	141	394	2,003	13,502	224	860	2,238	10,180
St. Charles	2,981	--	335	971	1,675	14,111	--	666	4,709	8,736
St. Louis	1,330	--	--	443	887	6,618	--	--	2,149	4,469
Ste. Genevieve	2,882	95	480	128	2,179	13,965	472	504	383	12,606
Scott	437	--	16	129	292	2,993	--	87	1,866	1,040
Stoddard	1,169	--	23	243	903	4,274	--	122	1,085	3,067
Warren	2,615	658	121	158	1,678	10,177	3,005	332	-88	6,928
All counties	44,267	957	3,754	6,041	33,515	195,875	3,749	11,422	25,108	155,596

¹ International 1/4-inch rule.

Table 20.--Average annual timber removals of growing stock and sawtimber on timberland by county and species group, Riverborder Unit, Missouri, 1988

County	Growing stock					Sawtimber				
	All species	Species group				All species	Species group			
		Pine	Other softwoods	Soft hardwoods	Hard hardwoods		Pine	Other softwoods	Soft hardwoods	Hard hardwoods
	----- Thousand cubic feet -----					----- Thousand board feet ¹ -----				
Boone	503	--	38	322	143	2,372	--	115	1,588	669
Callaway	1,490	--	20	25	1,445	3,857	--	--	--	3,857
Cape Girardeau	2,577	--	--	524	2,053	10,718	--	--	2,247	8,471
Cole	130	--	--	--	130	635	--	--	--	635
Dunklin	97	--	--	--	97	308	--	--	--	308
Franklin	3,183	--	94	421	2,668	11,414	--	169	1,497	9,748
Gasconade	773	--	41	39	693	2,890	--	--	180	2,710
Howard	249	--	--	--	249	1,029	--	--	--	1,029
Jefferson	2,103	--	14	--	2,089	8,382	--	--	--	8,382
Mississippi	-	--	--	--	--	--	--	--	--	--
Moniteau	111	--	--	--	111	--	--	--	--	--
Montgomery	791	--	--	137	654	2,975	--	--	505	2,470
New Madrid	132	--	--	132	--	642	--	--	642	--
Osage	1,144	--	--	--	1,144	3,427	--	--	--	3,427
Pemiscot	-	--	--	--	--	--	--	--	--	--
Perry	724	--	45	35	644	2,783	--	176	134	2,473
St. Charles	865	--	--	154	711	1,940	--	--	--	1,940
St. Louis	3,756	--	--	1,394	2,362	15,471	--	--	6,288	9,183
Ste. Genevieve	1,515	--	30	31	1,454	5,947	--	140	103	5,704
Scott	25	--	--	14	11	111	--	--	63	48
Stoddard	247	--	--	74	173	1,028	--	--	305	723
Warren	763	--	--	23	740	3,061	--	--	66	2,995
All counties	21,178	--	282	3,325	17,571	78,990	--	600	13,618	64,772

¹ International 1/4-inch rule.

Table 21.--Net annual growth and average annual removals of growing stock and sawtimber on timberland by species group, Riverborder Unit, Missouri, 1988

Species group	Growing stock		Sawtimber	
	Growth	Removals	Growth	Removals
	<i>Thousand cubic feet</i>		<i>Thousand board feet</i> ¹	
Softwoods				
White pine	658	--	3,005	--
Shortleaf pine	287	--	744	--
Other yellow pines	--	--	--	--
Baldcypress	215	--	1,157	--
Eastern redcedar	3,539	282	10,265	600
Other softwoods	12	--	--	--
Total	4,711	282	15,171	600
Hardwoods				
Select white oak	11,607	7,791	56,152	30,506
Other white oak	3,562	1,643	15,268	3,822
Select red oak	1,769	1,389	8,374	6,255
Other red oak	6,247	3,746	32,465	14,659
Select hickory	2,200	651	11,113	2,506
Other hickory	1,327	907	7,533	3,279
Basswood	54	--	217	--
Beech	19	--	90	--
Hard maple	3,754	81	13,908	334
Soft maple	1,401	133	3,927	461
Elm	1,135	588	2,200	1,593
Ash	1,368	865	4,309	2,061
Sycamore	622	466	3,219	2,234
Cottonwood	1,026	1,286	5,250	6,079
Willow	351	71	5,987	330
Hackberry	1,071	565	2,702	2,057
Aspen	10	--	--	--
Birch	221	32	515	144
Sweetgum	77	97	433	428
Tupelo	-12	23	463	109
Black cherry	188	96	257	327
Black walnut	318	141	2,915	614
Butternut	2	--	--	--
Yellow-poplar	116	--	453	--
Persimmon	249	146	136	157
Sassafras	98	46	51	--
Other hardwoods	776	133	2,767	435
Total	39,556	20,896	180,704	78,390
All species	44,267	21,178	195,875	78,990

¹International 1/4-inch rule.

Table 22.--Net annual growth and average annual removals of growing stock on timberland by ownership class and species group,
Riverborder Unit, Missouri, 1988

(In thousand cubic feet)

Ownership class	Growth					Removals				
	All species	Species group				All species	Species group			
		Pine	Other softwoods	Soft hardwoods	Hard hardwoods		Pine	Other softwoods	Soft hardwoods	Hard hardwoods
National forest	-417	--	8	4	-429	976	--	--	--	976
Miscellaneous federal	12	--	6	29	-23	--	--	--	--	--
State	2,588	658	401	601	928	666	--	--	493	173
County and municipal	648	--	--	451	197	1,714	--	--	1,231	483
Forest industry	328	--	--	111	217	137	--	--	137	--
Farmer	19,360	81	1,654	2,927	14,698	8,216	--	201	1,258	6,757
Miscellaneous private corporation	3,054	-16	219	259	2,592	3,074	--	67	--	3,007
Miscellaneous private individual	18,694	234	1,466	1,659	15,335	6,395	--	14	206	6,175
All owners	44,267	957	3,754	6,041	33,515	21,178	--	282	3,325	17,571

Table 23.--Net annual growth and average annual removals of sawtimber on timberland by ownership class and species group,
Riverborder Unit, Missouri, 1988

(In thousand board feet)¹

Ownership class	Growth					Removals				
	All species	Species group				All species	Species group			
		Pine	Other softwoods	Soft hardwoods	Hard hardwoods		Pine	Other softwoods	Soft hardwoods	Hard hardwoods
National forest	-1,402	--	20	20	-1,442	3,824	--	--	--	3,824
Miscellaneous federal	-30	--	35	25	-90	--	--	--	--	--
State	11,463	3,005	1,423	3,404	3,631	2,776	--	--	2,030	746
County and municipal	2,685	--	--	1,957	728	7,666	--	--	5,618	2,048
Forest industry	1,850	--	--	453	1,397	620	--	--	620	--
Farmer	82,898	688	2,274	12,827	67,109	28,778	--	431	4,876	23,471
Miscellaneous private corporation	16,686	-83	361	1,069	15,339	9,971	--	169	--	9,802
Miscellaneous private individual	81,725	139	7,309	5,353	68,924	25,355	--	--	474	24,881
All owners	195,875	3,749	11,422	25,108	155,596	78,990	--	600	13,618	64,772

¹ International 1/4-inch rule.

Table 24.--Annual mortality of growing stock and sawtimber on timberland by species group, Riverborder Unit, Missouri, 1988

Species group	Growing stock	Sawtimber
	<i>Thousand cubic feet</i>	<i>Thousand board feet</i> ¹
Softwoods		
White pine	--	--
Shortleaf pine	--	--
Other yellow pines	110	203
Baldcypress	--	--
Eastern redcedar	116	569
Other softwoods	446	1,268
Total	672	2,040
Hardwoods		
Select white oak	1,919	5,117
Other white oak	1,415	2,732
Select red oak	945	4,092
Other red oak	3,079	8,645
Select hickory	738	2,201
Other hickory	721	1,891
Basswood	5	1
Beech	3	5
Hard maple	197	277
Soft maple	199	558
Elm	1,196	3,042
Ash	563	987
Sycamore	301	1,118
Cottonwood	783	3,331
Willow	2,151	7,964
Hackberry	113	324
Aspen	--	--
Birch	115	406
Sweetgum	119	503
Tupelo	122	345
Black cherry	26	23
Black walnut	194	487
Butternut	--	--
Yellow-poplar	21	88
Persimmon	87	22
Sassafras	39	26
Other hardwoods	407	818
Total	15,458	45,003
All species	16,130	47,043

¹ International 1/4-inch rule.

Table 25.--Area of nonforest land with trees by county and land use class, Riverborder Unit, Missouri, 1989

(In thousand acres)

County	All classes	Land use class							Wooded pasture
		Cropland with trees	Improved pasture with trees	Wooded strips	Idle farmland with trees	Marsh with trees	Urban and other with trees	Windbreaks	
Boone	18.0	2.3	4.5	--	--	--	11.2	--	--
Callaway	35.4	--	29.5	--	--	--	2.6	3.3	--
Cape Girardeau	--	--	--	--	--	--	--	--	--
Cole	25.7	--	12.7	--	--	--	3.4	--	9.6
Dunklin	2.1	--	0.6	--	--	--	1.5	--	--
Franklin	35.7	--	3.0	5.3	--	--	20.7	--	6.7
Gasconade	18.1	--	2.3	--	--	--	--	15.8	--
Howard	15.1	--	12.3	2.8	--	--	--	--	--
Jefferson	32.0	--	2.8	--	--	--	26.1	--	3.1
Mississippi	--	--	--	--	--	--	--	--	--
Moniteau	5.8	--	5.8	--	--	--	--	--	--
Montgomery	16.8	2.3	--	--	--	--	14.5	--	--
New Madrid	--	--	--	--	--	--	--	--	--
Osage	22.3	4.5	6.3	--	--	--	3.5	--	8.0
Pemiscot	--	--	--	--	--	--	--	--	--
Perry	--	--	--	--	--	--	--	--	--
St. Charles	7.1	--	--	--	4.1	--	3.0	--	--
St. Louis	26.3	--	--	4.3	--	--	19.5	--	2.5
Ste. Genevieve	0.2	--	0.2	--	--	--	--	--	--
Scott	0.4	--	0.4	--	--	--	--	--	--
Stoddard	7.8	--	3.9	--	--	--	3.9	--	--
Warren	9.2	--	--	--	--	--	9.2	--	--
City of St. Louis	--	--	--	--	--	--	--	--	--
All counties	278.0	9.1	84.3	12.4	4.1	--	119.1	19.1	29.9

Table 26.--Net volume of short-log trees on timberland by species group and diameter class, Riverborder Unit, Missouri, 1989

(In thousand cubic feet)

Species group	All classes	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Softwoods									
White pine	--	--	--	--	--	--	--	--	--
Shortleaf pine	257	--	--	257	--	--	--	--	--
Other yellow pines	--	--	--	--	--	--	--	--	--
Baldcypress	254	--	--	--	--	--	--	254	--
Eastern redcedar	2,563	717	841	743	262	--	--	--	--
Other softwoods	--	--	--	--	--	--	--	--	--
Total	3,074	717	841	1,000	262	--	--	254	--
Hardwoods									
Select white oak	59,167	--	11,235	11,766	13,759	8,554	5,707	7,287	859
Other white oak	20,448	--	4,510	6,797	4,439	2,423	611	1,668	--
Select red oak	8,365	--	1,598	549	1,656	1,588	241	2,056	677
Other red oak	22,604	--	3,663	5,083	2,795	3,574	2,484	3,532	1,473
Select hickory	5,243	--	1,584	1,359	1,256	696	64	284	--
Other hickory	4,295	--	2,309	714	363	338	571	--	--
Basswood	190	--	--	--	--	190	--	--	--
Beech	--	--	--	--	--	--	--	--	--
Hard maple	2,864	--	430	1,589	221	267	--	357	--
Soft maple	3,185	--	284	279	223	1,085	--	645	669
Elm	1,916	--	527	533	86	589	--	125	56
Ash	8,980	--	3,224	2,657	1,334	705	170	890	--
Sycamore	2,005	--	191	--	527	378	--	688	221
Cottonwood	2,494	--	--	489	207	--	588	--	1,210
Willow	6,960	--	770	1,232	1,809	1,491	1,344	314	--
Hackberry	3,096	--	439	894	148	281	--	286	1,048
Aspen	--	--	--	--	--	--	--	--	--
Birch	--	--	--	--	--	--	--	--	--
Sweetgum	179	--	89	90	--	--	--	--	--
Tupelo	1,766	--	947	727	92	--	--	--	--
Black cherry	1,417	--	638	188	409	182	--	--	--
Black walnut	1,447	--	588	324	348	187	--	--	--
Butternut	--	--	--	--	--	--	--	--	--
Yellow-poplar	--	--	--	--	--	--	--	--	--
Persimmon	--	--	--	--	--	--	--	--	--
Sassafras	56	--	56	--	--	--	--	--	--
Other hardwoods	1,826	--	204	1,084	196	27	197	118	--
Total	158,503	--	33,286	36,354	29,868	22,555	11,977	18,250	6,213
All species	161,577	717	34,127	37,354	30,130	22,555	11,977	18,504	6,213

Table 27.--Net volume of short-log trees on timberland by species group and diameter class, Riverborder Unit, Missouri, 1989

(In thousand board feet) ¹

Species group	All classes	Diameter class (inches at breast height)							
		9.0- 10.9	11.0- 12.9	13.0- 14.9	15.0- 16.9	17.0- 18.9	19.0- 20.9	21.0- 28.9	29.0+
Softwoods									
White pine	--	--	--	--	--	--	--	--	--
Shortleaf pine	993	--	--	993	--	--	--	--	--
Other yellow pines	--	--	--	--	--	--	--	--	--
Baldcypress	412	--	--	--	--	--	--	412	--
Eastern redcedar	10,972	3,485	3,695	2,880	912	--	--	--	--
Other softwoods	--	--	--	--	--	--	--	--	--
Total	12,377	3,485	3,695	3,873	912	--	--	412	--
Hardwoods									
Select white oak	173,358	--	35,416	36,051	40,754	24,685	15,861	18,820	1,771
Other white oak	65,874	--	16,128	23,103	14,302	7,063	1,595	3,683	--
Select red oak	23,340	--	4,864	1,657	4,910	4,631	669	5,239	1,370
Other red oak	64,165	--	12,221	16,478	8,625	10,562	6,968	8,203	1,108
Select hickory	14,973	--	5,035	3,984	3,467	1,726	150	611	--
Other hickory	13,502	--	7,619	2,252	1,095	952	1,584	--	--
Basswood	525	--	--	--	--	525	--	--	--
Beech	--	--	--	--	--	--	--	--	--
Hard maple	7,806	--	1,236	4,470	590	669	--	841	--
Soft maple	8,024	--	726	723	580	2,816	--	1,608	1,571
Elm	6,134	--	1,780	1,782	273	1,790	--	369	140
Ash	27,841	--	10,314	8,430	4,158	2,138	494	2,307	--
Sycamore	4,654	--	420	--	1,173	864	--	1,626	571
Cottonwood	5,926	--	--	1,162	496	--	1,468	--	2,800
Willow	16,707	--	1,705	2,855	4,336	3,660	3,351	800	--
Hackberry	8,600	--	1,427	2,940	464	870	--	777	2,122
Aspen	--	--	--	--	--	--	--	--	--
Birch	--	--	--	--	--	--	--	--	--
Sweetgum	513	--	256	257	--	--	--	--	--
Tupelo	5,041	--	2,715	2,073	253	--	--	--	--
Black cherry	4,024	--	1,831	535	1,152	506	--	--	--
Black walnut	5,035	--	2,187	1,115	1,148	585	--	--	--
Butternut	--	--	--	--	--	--	--	--	--
Yellow-poplar	--	--	--	--	--	--	--	--	--
Persimmon	--	--	--	--	--	--	--	--	--
Sassafras	160	--	160	--	--	--	--	--	--
Other hardwoods	5,076	--	585	3,069	540	73	510	299	--
Total	461,278	--	106,625	112,936	88,316	64,115	32,650	45,183	11,453
All species	473,655	3,485	110,320	116,809	89,228	64,115	32,650	45,595	11,453

¹ International 1/4-inch rule.

Table 28.--Net volume of growing stock on timberland by species group and forest type, Riverborder Unit, Missouri, 1989

(In thousand cubic feet)

Species group	All types	Forest type											
		Short-leaf pine	Eastern redcedar	Eastern redcedar-hardwood	Shortleaf pine - oak	Post-blackjack oak	Black-scarlet oak	White oak	Oak-gum-cypress	Elm-ash-soft maple	Cottonwood	Maple-beech	Non-stocked ¹
Softwoods													
White pine	13,843	--	--	--	--	--	--	--	--	--	--	13,843	--
Shortleaf pine	8,203	2,703	--	--	3,324	188	1,008	980	--	--	--	--	--
Other yellow pines	--	--	--	--	--	--	--	--	--	--	--	--	--
Baldcypress	12,600	--	--	--	--	--	--	--	8,767	3,833	--	--	--
Eastern redcedar	100,836	--	41,779	30,967	--	6,871	7,482	9,354	--	174	--	4,209	--
Other softwoods	462	--	--	--	--	--	--	--	--	--	--	462	--
Total	135,944	2,703	41,779	30,967	3,324	7,059	8,490	10,334	8,767	4,007	--	18,514	--
Hardwoods													
Select white oak	511,439	471	1,026	18,112	1,252	27,068	84,354	356,620	--	1,570	--	20,966	--
Other white oak	181,430	--	1,325	11,331	--	112,653	26,827	21,021	6,530	506	--	1,237	--
Select red oak	97,665	--	355	3,591	--	5,106	39,199	41,579	892	1,057	--	5,886	--
Other red oak	255,310	791	2,036	6,565	748	23,567	161,259	45,874	4,585	2,182	--	7,703	--
Select hickory	105,783	216	303	4,391	--	12,142	40,169	40,421	--	1,366	--	6,775	--
Other hickory	69,155	--	77	1,394	254	11,618	28,216	22,303	--	2,472	--	2,821	--
Basswood	1,906	--	--	--	--	--	--	281	--	541	--	1,084	--
Beech	513	--	--	--	--	--	409	--	--	--	--	104	--
Hard maple	32,670	--	--	907	--	570	4,286	13,734	--	89	--	13,084	--
Soft maple	21,577	--	--	--	--	--	163	333	1,350	14,999	1,369	3,363	--
Elm	27,882	--	653	616	203	713	5,688	6,088	291	2,367	--	11,263	--
Ash	56,460	--	216	2,742	--	3,803	8,581	17,167	3,664	6,894	366	13,027	--
Sycamore	37,405	--	494	996	--	357	5,056	2,849	--	23,412	1,305	2,936	--
Cottonwood	51,343	--	--	--	--	--	386	--	45	28,286	22,201	425	--
Willow	63,433	--	--	--	--	--	330	--	3,737	59,366	--	--	--
Hackberry	14,128	--	--	875	--	--	2,442	2,506	--	6,737	--	1,568	--
Aspen	393	--	--	--	--	--	--	--	393	--	--	--	--
Birch	5,654	--	--	377	--	--	936	167	114	2,276	--	1,784	--
Sweetgum	4,773	--	--	--	--	--	1,366	271	47	1,120	--	1,969	--
Tupelo	9,449	--	--	--	293	435	3,443	923	3,980	--	--	375	--
Black cherry	5,550	--	--	116	--	253	2,494	1,441	--	--	--	1,246	--
Black walnut	23,823	--	--	1,335	--	2,436	5,509	5,219	--	3,033	--	6,291	--
Butternut	170	--	--	--	--	--	170	--	--	--	--	--	--
Yellow-poplar	3,639	--	--	--	--	--	2,282	271	--	--	--	1,086	--
Persimmon	2,890	--	--	766	--	228	720	539	458	179	--	--	--
Sassafras	1,773	--	--	--	--	--	1,492	281	--	--	--	--	--
Other hardwoods	20,590	--	403	1,037	--	420	5,661	3,084	1,085	7,725	395	780	--
Total	1,606,803	1,478	6,888	55,151	2,750	201,369	431,438	582,972	27,171	166,177	25,636	105,773	--
All species	1,742,747	4,181	48,667	86,118	6,074	208,428	439,928	593,306	35,938	170,184	25,636	124,287	--

¹ Nonstocked with all live trees.

Table 29.--Net volume of sawtimber on timberland by species group and forest type, Riverborder Unit, Missouri, 1989

(In thousand board feet) ¹

Species group	All types	Forest type											Non- ² stocked
		Short-leaf pine	Eastern redcedar	Eastern redcedar-hardwood	Shortleaf pine - oak	Post-blackjack oak	Black-scarlet oak	White oak	Oak-gum-cypress	Elm-ash-soft maple	Cottonwood	Maple-beech	
Softwoods													
White pine	54,123	--	--	--	--	--	--	--	--	--	--	54,123	--
Shortleaf pine	23,692	1,640	--	--	13,860	--	5,357	2,835	--	--	--	--	--
Other yellow pines	--	--	--	--	--	--	--	--	--	--	--	--	--
Baldcypress	61,836	--	--	--	--	--	--	--	42,720	19,116	--	--	--
Eastern redcedar	274,255	--	121,943	75,947	--	18,320	24,039	24,129	--	865	--	9,012	--
Other softwoods	--	--	--	--	--	--	--	--	--	--	--	--	--
Total	413,906	1,640	121,943	75,947	13,860	18,320	29,396	26,964	42,720	19,981	--	63,135	--
Hardwoods													
Select white oak	1,804,232	2,209	4,199	66,078	5,894	93,344	280,911	1,257,664	--	3,382	--	90,551	--
Other white oak	417,709	--	3,286	31,858	--	229,794	65,128	56,229	23,761	1,857	--	5,796	--
Select red oak	392,549	--	--	16,572	--	18,555	157,248	169,971	3,939	3,136	--	23,128	--
Other red oak	876,744	3,908	6,202	21,569	3,606	62,013	570,364	147,341	19,241	9,387	--	33,113	--
Select hickory	245,933	--	1,485	7,094	--	14,081	86,080	109,043	--	5,860	--	22,290	--
Other hickory	179,673	--	--	4,035	--	16,286	75,529	65,172	--	9,029	--	9,622	--
Basswood	6,662	--	--	--	--	--	--	--	--	2,629	--	4,033	--
Beech	2,228	--	--	--	--	--	1,701	--	--	--	--	527	--
Hard maple	67,295	--	--	1,537	--	--	9,255	24,040	--	--	--	32,463	--
Soft maple	54,578	--	--	--	--	--	--	1,453	3,527	37,370	974	11,254	--
Elm	46,005	--	929	--	--	899	4,840	9,492	1,370	3,429	--	25,046	--
Ash	168,487	--	--	6,660	--	10,077	18,965	49,737	13,734	23,438	--	45,876	--
Sycamore	159,693	--	--	3,229	--	1,606	20,559	12,694	--	106,064	5,376	10,165	--
Cottonwood	242,423	--	--	--	--	--	513	--	--	132,465	107,267	2,178	--
Willow	271,333	--	--	--	--	--	1,420	--	9,682	260,231	--	--	--
Hackberry	33,872	--	--	868	--	--	4,301	4,135	--	20,026	--	4,542	--
Aspen	--	--	--	--	--	--	--	--	--	--	--	--	--
Birch	18,636	--	--	--	--	--	4,334	--	--	6,242	--	8,060	--
Sweetgum	18,752	--	--	--	--	--	5,673	1,221	--	4,996	--	6,862	--
Tupelo	33,786	--	--	--	1,339	1,068	10,176	4,221	15,262	--	--	1,720	--
Black cherry	13,420	--	--	--	--	1,163	3,195	4,025	--	--	--	5,037	--
Black walnut	73,130	--	--	3,809	--	4,556	13,907	20,221	--	10,609	--	20,028	--
Butternut	--	--	--	--	--	--	--	--	--	--	--	--	--
Yellow-poplar	15,895	--	--	--	--	--	10,031	995	--	--	--	4,869	--
Persimmon	1,566	--	--	--	--	--	--	--	1,566	--	--	--	--
Sassafras	1,761	--	--	--	--	--	1,761	--	--	--	--	--	--
Other hardwoods	53,278	--	--	4,814	--	--	12,518	10,778	3,037	17,779	1,197	3,155	--
Total	5,199,640	6,117	16,101	168,123	10,839	453,442	1,358,409	1,948,432	95,119	657,929	114,814	370,315	--
All species	5,613,546	7,757	138,044	244,070	24,699	471,762	1,387,805	1,975,396	137,839	677,910	114,814	433,450	--

¹ International 1/4-inch rule.² Nonstocked with all live trees.

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1991. **Timber resource of Missouri's Riverborder.** Resour. Bull. NC-118. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 50 p.

Presents highlights and statistics on area, volume, growth, removals, and mortality found in the fourth forest inventory of Missouri's Riverborder.

KEY WORDS: Area, volume, growth, removals, mortality.

Our job at the North Central Forest Experiment Station is discovering and creating new knowledge and technology in the field of natural resources and conveying this information to the people who can use it. As a new generation of forests emerges in our region, managers are confronted with two unique challenges: (1) Dealing with the great diversity in composition, quality, and ownership of the forests, and (2) Reconciling the conflicting demands of the people who use them. Helping the forest manager meet these challenges while protecting the environment is what research at North Central is all about.

